SEQUENCE LISTING

<110> RIKIHISA, YASUKO
OHASHI, NORIO

<120> OUTER MEMBRANE PROTEIN OF EHRLICHIA CANIS AND EHRLICHIA CHAFFEENSIS

<130> 22727-04109

<140> 10/059,964
<141> 2002-01-28

<150> 09/314,701
<151> 1999-05-19

<150> 60/100,843
<151> 1998-09-18

<160> 69

<170> PatentIn Ver. 3.2

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<212> DNA
<213> Ehrlichia chaffeensis

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acagttggag tgtttggact gaagcaaaat tgggacggaa gcgcaatatc caactcctcc 240
ccaaacgatg tattcactgt ctcaaattat tcatttaaat atgaaaacaa cccgttttta 300
ggttttgcag gagctattgg ttactcaatg gatggtccaa gaatagagct tgaagtatct 360
tatgaaacat ttgatgtaaa aaatcaaggt aacaattata agaatgaagc acatagatat 420
tgtgctctat cccataactc agcagcagac atgagtagtg caagtaataa ttttgtcttt 480
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<213> Ehrlichia chaffeensis

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Asn Gly Asn Phe Tyr Ile Ser Gly Lys Tyr Met Pro Ser Ala Ser His
        35                  40                  45

Phe Gly Val Phe Ser Ala Lys Glu Glu Arg Asn Thr Thr Val Gly Val
    50                  55                  60

Phe Gly Leu Lys Gln Asn Trp Asp Gly Ser Ala Ile Ser Asn Ser Ser
65                  70                  75                  80

Pro Asn Asp Val Phe Thr Val Ser Asn Tyr Ser Phe Lys Tyr Glu Asn
                85                  90                  95

Asn Pro Phe Leu Gly Phe Ala Gly Ala Ile Gly Tyr Ser Met Asp Gly
            100                 105                 110

Pro Arg Ile Glu Leu Glu Val Ser Tyr Glu Thr Phe Asp Val Lys Asn
        115                 120                 125

Gln Gly Asn Asn Tyr Lys Asn Glu Ala His Arg Tyr Cys Ala Leu Ser
    130                 135                 140

His Asn Ser Ala Ala Asp Met Ser Ser Ala Ser Asn Asn Phe Val Phe
145                 150                 155                 160

Leu Lys Asn Glu Gly Leu Leu Asp Ile Ser Phe Met Leu Asn Ala Cys
                165                 170                 175

Tyr Asp Val Val Gly Glu Gly Ile Pro Phe Ser Pro Tyr Ile Cys Ala
            180                 185                 190

Gly Ile Gly Thr Asp Leu Val Ser Met Phe Glu Ala Thr Asn Pro Lys
        195                 200                 205

Ile Ser Tyr Gln Gly Lys Leu Gly Leu Ser Tyr Ser Ile Ser Pro Glu
    210                 215                 220

Ala Ser Val Phe Ile Gly Gly His Phe His Lys Val Leu Gly Asn Glu
225                 230                 235                 240

Phe Arg Asp Ile Pro Thr Ile Ile Pro Thr Gly Ser Thr Leu Ala Gly
                245                 250                 255

Lys Gly Asn Tyr Pro Ala Ile Val Ile Leu Asp Val Cys His Phe Gly
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Ile Glu Leu Gly Gly Arg Phe Ala Phe
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agctatccaa tcacaccaga agtttccgct tttattggag gatactacca cggagttata 720
ggaaataatt ttaacaaaat acctgtaata acacctgtag tattagaagg agctcctcaa 780
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<213> Ehrlichia chaffeensis

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Thr Gly Ile Asn Asp Ser Arg Glu Gly Phe Tyr Ile Ser Val Lys Tyr
35 40 45

Asn Pro Ser Ile Ser His Phe Arg Lys Phe Ser Ala Glu Glu Ala Pro
50 55 60

Ile Asn Gly Asn Thr Ser Ile Thr Lys Lys Val Phe Gly Leu Lys Lys
65 70 75 80

Asp Gly Asp Ile Ala Gln Ser Ala Asn Phe Asn Arg Thr Asp Pro Ala
85 90 95

Leu Glu Phe Gln Asn Asn Leu Ile Ser Gly Phe Ser Gly Ser Ile Gly
100 105 110

Tyr Ala Met Asp Gly Pro Arg Ile Glu Leu Glu Ala Ala Tyr Gln Lys
115 120 125

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Phe Asp Ala Lys Asn Pro Asp Asn Asn Asp Thr Asn Ser Gly Asp Tyr
    130                 135                 140

Tyr Lys Tyr Phe Gly Leu Ser Arg Glu Asp Ala Ile Ala Asp Lys Lys
145                 150                 155                 160

Tyr Val Val Leu Lys Asn Glu Gly Ile Thr Phe Met Ser Leu Met Val
                165                 170                 175

Asn Thr Cys Tyr Asp Ile Thr Ala Glu Gly Val Pro Phe Ile Pro Tyr
            180                 185                 190

Ala Cys Ala Gly Val Gly Ala Asp Leu Ile Asn Val Phe Lys Asp Phe
        195                 200                 205

Asn Leu Lys Phe Ser Tyr Gln Gly Lys Ile Gly Ile Ser Tyr Pro Ile
    210                 215                 220

Thr Pro Glu Val Ser Ala Phe Ile Gly Gly Tyr Tyr His Gly Val Ile
225                 230                 235                 240

Gly Asn Asn Phe Asn Lys Ile Pro Val Ile Thr Pro Val Val Leu Glu
                245                 250                 255

Gly Ala Pro Gln Thr Thr Ser Ala Leu Val Thr Ile Asp Thr Gly Tyr
            260                 265                 270

Phe Gly Gly Glu Val Gly Val Arg Phe Thr Phe
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cctactgtcg cgttgtatgg tttgaaacaa gattggaacg gtgttagtgc ttcaagtcat 240
gctgatgcgg actttaataa caaaggttat tcttttaaat acgaaaacaa tccatttcta 300
ggttttgcag gagctattgg ttattcaatg ggtggtccaa gaatagagtt tgaagtgtcc 360
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tgtgccttag atcgtaaagc aagcagcact aatgccacag ctagtcacta cgtgctacta 480
aaaaatgaag gactacttga tatatcactt atgttgaatg catgctatga cgtagtaagt 540
gaaggaatac ctttctctcc ttacatatgt gcaggtgttg gtaccgattt aatatccatg 600
tttgaagcta taaaccctaa aatttcttat caaggaaagt taggtttgag ttactctata 660
aacccagaag cttctgtctt tgttggtgga cattttcata aagttgcagg taatgaattc 720
agggacattt ctactcttaa agcgtttgct acaccatcat ctgcagctac tccagactta 780
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<213> Ehrlichia chaffeensis

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Ser Phe Leu Pro Gly Ile Leu Leu Ser Glu Pro Val Gln Asp Asp Ser
             20                  25                  30

Val Ser Gly Asn Phe Tyr Ile Ser Gly Lys Tyr Met Pro Ser Ala Ser
         35                  40                  45

His Phe Gly Val Phe Ser Ala Lys Glu Glu Lys Asn Pro Thr Val Ala
     50                  55                  60

Leu Tyr Gly Leu Lys Gln Asp Trp Asn Gly Val Ser Ala Ser Ser His
 65                  70                  75                  80

Ala Asp Ala Asp Phe Asn Asn Lys Gly Tyr Ser Phe Lys Tyr Glu Asn
                 85                  90                  95

Asn Pro Phe Leu Gly Phe Ala Gly Ala Ile Gly Tyr Ser Met Gly Gly
            100                 105                 110

Pro Arg Ile Glu Phe Glu Val Ser Tyr Glu Thr Phe Asp Val Lys Asn
        115                 120                 125

Gln Gly Gly Asn Tyr Lys Asn Asp Ala His Arg Tyr Cys Ala Leu Asp
    130                 135                 140

Arg Lys Ala Ser Ser Thr Asn Ala Thr Ala Ser His Tyr Val Leu Leu
145                 150                 155                 160

Lys Asn Glu Gly Leu Leu Asp Ile Ser Leu Met Leu Asn Ala Cys Tyr
                165                 170                 175

Asp Val Val Ser Glu Gly Ile Pro Phe Ser Pro Tyr Ile Cys Ala Gly
            180                 185                 190

Val Gly Thr Asp Leu Ile Ser Met Phe Glu Ala Ile Asn Pro Lys Ile
        195                 200                 205

Ser Tyr Gln Gly Lys Leu Gly Leu Ser Tyr Ser Ile Asn Pro Glu Ala
    210                 215                 220

Ser Val Phe Val Gly Gly His Phe His Lys Val Ala Gly Asn Glu Phe
225                 230                 235                 240

Arg Asp Ile Ser Thr Leu Lys Ala Phe Ala Thr Pro Ser Ser Ala Ala
                245                 250                 255
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Thr Pro Asp Leu Ala Thr Val Thr Leu Ser Val Cys His Phe Gly Val
            260                 265                 270

Glu Leu Gly Gly Arg Phe Asn Phe
        275                 280
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<213> Ehrlichia chaffeensis

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ggaaagtata tgccaagcgc ttcgcatttt ggagtttttt ctgccaagga agaaagaaat 180
acaacagttg gagtatttgg aatagagcaa gattgggata gatgtgtaat atctagaacc 240
actttaagcg atatattcac cgttccaaat tattcattta agtatgaaaa taatctattt 300
tcaggatttg caggagctat tggctactca atggatggcc caagaataga gcttgaagta 360
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tattatgctc tgtcccatct tctcggcaca gagacacaga tagatggtgc aggcagtgcg 480
tctgtctttc taataaatga aggactactt gataaatcat ttatgctgaa cgcatgttat 540
gatgtaataa gtgaaggcat acctttttct ccttatatat gtgcaggtat tggtattgat 600
ttagtatcca tgtttgaagc tataaatcct aaaatttctt atcaaggaaa attaggctta 660
agttacccta taagcccaga agcttctgtg tttattggtg gacattttca taaggtgata 720
ggaaacgaat ttagagatat tcctactatg atacctagtg aatcagcgct tgcaggaaaa 780
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<210> 8
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<213> Ehrlichia chaffeensis

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Ser Phe Leu Pro Gly Ile Ser Leu Ser Asp Pro Val Gln Asp Asp Asn
             20                  25                  30

Ile Ser Gly Asn Phe Tyr Ile Ser Gly Lys Tyr Met Pro Ser Ala Ser
         35                  40                  45

His Phe Gly Val Phe Ser Ala Lys Glu Glu Arg Asn Thr Thr Val Gly
     50                  55                  60

Val Phe Gly Ile Glu Gln Asp Trp Asp Arg Cys Val Ile Ser Arg Thr
 65                  70                  75                  80

Thr Leu Ser Asp Ile Phe Thr Val Pro Asn Tyr Ser Phe Lys Tyr Glu
                 85                  90                  95
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Asn Asn Leu Phe Ser Gly Phe Ala Gly Ala Ile Gly Tyr Ser Met Asp
100 105 110

Gly Pro Arg Ile Glu Leu Glu Val Ser Tyr Glu Ala Phe Asp Val Lys
115 120 125

Asn Gln Gly Asn Asn Tyr Lys Asn Glu Ala His Arg Tyr Tyr Ala Leu
130 135 140

Ser His Leu Leu Gly Thr Glu Thr Gln Ile Asp Gly Ala Gly Ser Ala
145 150 155 160

Ser Val Phe Leu Ile Asn Glu Gly Leu Leu Asp Lys Ser Phe Met Leu
165 170 175

Asn Ala Cys Tyr Asp Val Ile Ser Glu Gly Ile Pro Phe Ser Pro Tyr
180 185 190

Ile Cys Ala Gly Ile Gly Ile Asp Leu Val Ser Met Phe Glu Ala Ile
195 200 205

Asn Pro Lys Ile Ser Tyr Gln Gly Lys Leu Gly Leu Ser Tyr Pro Ile
210 215 220

Ser Pro Glu Ala Ser Val Phe Ile Gly Gly His Phe His Lys Val Ile
225 230 235 240

Gly Asn Glu Phe Arg Asp Ile Pro Thr Met Ile Pro Ser Glu Ser Ala
245 250 255

Leu Ala Gly Lys Gly Asn Tyr Pro Ala Ile Val Thr Leu Asp Val Phe
260 265 270

Tyr Phe Gly Ile Glu Leu Gly Gly Arg Phe Asn Phe Gln Leu
275 280 285

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ggcaagtata tgccaagtgc ttcgcatttt ggcatgtttt ctgccaaaga agaaaaaaat 180
cctactgttg cattgtatgg cttaaaacaa gattgggaag ggattagctc atcaagtcac 240
aatgataatc atttcaataa caagggttat tcatttaaat atgaaaataa cccattttta 300
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tgtgctttag gtcaacaaga caacagcgga atacctaaaa ctagtaaata cgtactgtta 480
aaaagcgaag gattgcttga catatcattt atgctaaatg catgctatga tataataaac 540
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aacccagaag cttctgtatt tattggtgga cattttcata aggtgatagg aaacgaattt 720
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<213> Ehrlichia chaffeensis

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             20                  25                  30

Ile Ser Gly Asn Phe Tyr Val Ser Gly Lys Tyr Met Pro Ser Ala Ser
         35                  40                  45

His Phe Gly Met Phe Ser Ala Lys Glu Glu Lys Asn Pro Thr Val Ala
     50                  55                  60

Leu Tyr Gly Leu Lys Gln Asp Trp Glu Gly Ile Ser Ser Ser Ser His
 65                  70                  75                  80

Asn Asp Asn His Phe Asn Asn Lys Gly Tyr Ser Phe Lys Tyr Glu Asn
                 85                  90                  95

Asn Pro Phe Leu Gly Phe Ala Gly Ala Ile Gly Tyr Ser Met Gly Gly
            100                 105                 110

Pro Arg Val Glu Phe Glu Val Ser Tyr Glu Thr Phe Asp Val Lys Asn
        115                 120                 125

Gln Gly Asn Asn Tyr Lys Asn Asp Ala His Arg Tyr Cys Ala Leu Gly
    130                 135                 140

Gln Gln Asp Asn Ser Gly Ile Pro Lys Thr Ser Lys Tyr Val Leu Leu
145                 150                 155                 160

Lys Ser Glu Gly Leu Leu Asp Ile Ser Phe Met Leu Asn Ala Cys Tyr
                165                 170                 175

Asp Ile Ile Asn Glu Ser Ile Pro Leu Ser Pro Tyr Ile Cys Ala Gly
            180                 185                 190

Val Gly Thr Asp Leu Ile Ser Met Phe Glu Ala Thr Asn Pro Lys Ile
        195                 200                 205

Ser Tyr Gln Gly Lys Leu Gly Leu Ser Tyr Ser Ile Asn Pro Glu Ala
    210                 215                 220
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Ser Val Phe Ile Gly Gly His Phe His Lys Val Ile Gly Asn Glu Phe
225 230 235 240

Arg Asp Ile Pro Thr Leu Lys Ala Phe Val Thr Ser Ser Ala Thr Pro
245 250 255

Asp Leu Ala Ile Val Thr Leu Ser Val Cys His Phe Gly Ile Glu Leu
260 265 270

Gly Gly Arg Phe Asn Phe
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<211> 843
<212> DNA
<213> Ehrlichia chaffeensis

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gggaaatatg taccaagtgt ttcacatttt ggcgtattct ctgctaaaca ggaaagaaat 180
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tctccagaaa atacatttaa cgttccaaat tattcattta aatatgaaaa taatccattt 300
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tcctatgaaa catttgatgt gaaaaaccag ggtaataact ataagaacga tgctcacaaa 420
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tccataagcc cagaagcttc tgtttttgtt ggtggacatt ttcataaggt gatagggaat 720
gaattcagag atattcctgc tatgataccc agtacctcaa ctctcacagg taatcacttt 780
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<213> Ehrlichia chaffeensis

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20 25 30

Val Gly Gly Asn Phe Tyr Ile Ser Gly Lys Tyr Val Pro Ser Val Ser
35 40 45

His Phe Gly Val Phe Ser Ala Lys Gln Glu Arg Asn Thr Thr Thr Gly
50 55 60

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Val Phe Gly Leu Lys Gln Asp Trp Asp Gly Ser Thr Ile Ser Lys Asn
 65                  70                  75                  80

Ser Pro Glu Asn Thr Phe Asn Val Pro Asn Tyr Ser Phe Lys Tyr Glu
                 85                  90                  95

Asn Asn Pro Phe Leu Gly Phe Ala Gly Ala Val Gly Tyr Leu Met Asn
            100                 105                 110

Gly Pro Arg Ile Glu Leu Glu Met Ser Tyr Glu Thr Phe Asp Val Lys
        115                 120                 125

Asn Gln Gly Asn Asn Tyr Lys Asn Asp Ala His Lys Tyr Tyr Ala Leu
    130                 135                 140

Thr His Asn Ser Gly Gly Lys Leu Ser Asn Ala Gly Asp Lys Phe Val
145                 150                 155                 160

Phe Leu Lys Asn Glu Gly Leu Leu Asp Ile Ser Leu Met Leu Asn Ala
                165                 170                 175

Cys Tyr Asp Val Ile Ser Glu Gly Ile Pro Phe Ser Pro Tyr Ile Cys
            180                 185                 190

Ala Gly Val Gly Thr Asp Leu Ile Ser Met Phe Glu Ala Ile Asn Pro
        195                 200                 205

Lys Ile Ser Tyr Gln Gly Lys Leu Gly Leu Ser Tyr Ser Ile Ser Pro
    210                 215                 220

Glu Ala Ser Val Phe Val Gly Gly His Phe His Lys Val Ile Gly Asn
225                 230                 235                 240

Glu Phe Arg Asp Ile Pro Ala Met Ile Pro Ser Thr Ser Thr Leu Thr
                245                 250                 255

Gly Asn His Phe Thr Ile Val Thr Leu Ser Val Cys His Phe Gly Val
            260                 265                 270

Glu Leu Gly Gly Arg Phe Asn Phe
        275                 280
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<212> DNA
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gtaaaagaaa ctaatgttcc cacaaagcag ttaatagcac ttaaaaaaga cattaattct 240
gttgcagttg gtagtaatgc tactacaggt attagcaatc caggtaattt cacaattcct 300

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cctgatagtc taagaattga aatagaggga tttcatgaaa aatttgatgt caaaaaccct 420
ggaggttaca cacaagtaaa agatgcgtac cgttattttg cactagcacg tgatttaaaa 480
gatggcttct ttgaacctaa agcggaagat acaggtgttt atcatactgt tatgaaaaat 540
gatggattat ctattttatc tactatggtt aacgtctgtt acgatttttc tgtagatgaa 600
ttaccagtct taccttatat atgtgcaggt atgggtataa acgccataga attcttcgac 660
gctttacatg taaaatttgc ttaccaaggc aaactaggta ttagctatca actatttact 720
aaagtaaatt tattccttga tgggtattac catcaagtaa taggcaatca attcaaaaac 780
ttaaacgtaa accatgttta cacacttaaa gaatctccta aagtcacatc tgcagtagct 840
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<212> PRT
<213> Ehrlichia chaffeensis

<400> 14

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             20                  25                  30

Ile Asn Asn Ser Ala Lys Lys Gln Pro Gly Leu Tyr Ile Ser Gly Gln
         35                  40                  45

Tyr Lys Pro Ser Val Ser Val Phe Ser Asn Phe Ser Val Lys Glu Thr
     50                  55                  60

Asn Val Pro Thr Lys Gln Leu Ile Ala Leu Lys Lys Asp Ile Asn Ser
 65                  70                  75                  80

Val Ala Val Gly Ser Asn Ala Thr Thr Gly Ile Ser Asn Pro Gly Asn
                 85                  90                  95

Phe Thr Ile Pro Tyr Thr Ala Glu Phe Gln Asp Asn Val Ala Asn Phe
            100                 105                 110

Asn Gly Ala Val Gly Tyr Ser Phe Pro Asp Ser Leu Arg Ile Glu Ile
        115                 120                 125

Glu Gly Phe His Glu Lys Phe Asp Val Lys Asn Pro Gly Gly Tyr Thr
    130                 135                 140

Gln Val Lys Asp Ala Tyr Arg Tyr Phe Ala Leu Ala Arg Asp Leu Lys
145                 150                 155                 160

Asp Gly Phe Phe Glu Pro Lys Ala Glu Asp Thr Gly Val Tyr His Thr
                165                 170                 175

Val Met Lys Asn Asp Gly Leu Ser Ile Leu Ser Thr Met Val Asn Val
            180                 185                 190
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Cys Tyr Asp Phe Ser Val Asp Glu Leu Pro Val Leu Pro Tyr Ile Cys
        195                 200                 205

Ala Gly Met Gly Ile Asn Ala Ile Glu Phe Phe Asp Ala Leu His Val
    210                 215                 220

Lys Phe Ala Tyr Gln Gly Lys Leu Gly Ile Ser Tyr Gln Leu Phe Thr
225                 230                 235                 240

Lys Val Asn Leu Phe Leu Asp Gly Tyr Tyr His Gln Val Ile Gly Asn
                245                 250                 255

Gln Phe Lys Asn Leu Asn Val Asn His Val Tyr Thr Leu Lys Glu Ser
            260                 265                 270

Pro Lys Val Thr Ser Ala Val Ala Thr Leu Asp Ile Ala Tyr Phe Gly
        275                 280                 285

Gly Glu Val Gly Ile Arg Phe Thr Phe
    290                 295
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atatgtgtta tcagtctact aagaactaat atctttaacg ttagcacaaa aaaattaata 180
aaagataaat gtcgtgatac taagtttagt aacatgaatt gttatttgta cggtaaaccg 240
ttaaatttac aaatttttta tggaatattt tcctttatta gaaactttca aaataacaca 300
ctaataattc ctaatgatag taaatgcggc ttctatacca cgttatggga taatccagca 360
ctacattata catatacact tactggcagt gagtaccgta atttttttga cattctatat 420
gaaaacatta tctgtcaatg taaattactt attaactata accgttctgt attaaaccaa 480
cataataaaa atactctcgt aataatacca atacctaatg ctagagagtt cagtaatgaa 540
attcgagtaa ggaatatatc aataaataag gaaagttctt atgagtgcta a 591

<210> 16
<211> 196
<212> PRT
<213> Ehrlichia chaffeensis

<400> 16
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Met Ile Tyr Lys Glu Lys Leu Thr Arg Val Gly Glu Tyr Ile Leu Ala
  1               5                  10                  15

Tyr Leu Ser Phe Ile Leu Ser Thr Tyr Ile Phe Leu Val Leu Val Asn
             20                  25                  30

Ile Ile Arg Tyr Asn Ser Leu Ala Ile Cys Val Ile Ser Leu Leu Arg
         35                  40                  45
```

```
Thr Asn Ile Phe Asn Val Ser Thr Lys Lys Leu Ile Lys Asp Lys Cys
     50                  55                  60

Arg Asp Thr Lys Phe Ser Asn Met Asn Cys Tyr Leu Tyr Gly Lys Pro
 65                  70                  75                  80

Leu Asn Leu Gln Ile Phe Tyr Gly Ile Phe Ser Phe Ile Arg Asn Phe
                 85                  90                  95

Gln Asn Asn Thr Leu Ile Ile Pro Asn Asp Ser Lys Cys Gly Phe Tyr
            100                 105                 110

Thr Thr Leu Trp Asp Asn Pro Ala Leu His Tyr Thr Tyr Thr Leu Thr
        115                 120                 125

Gly Ser Glu Tyr Arg Asn Phe Phe Asp Ile Leu Tyr Glu Asn Ile Ile
    130                 135                 140

Cys Gln Cys Lys Leu Leu Ile Asn Tyr Asn Arg Ser Val Leu Asn Gln
145                 150                 155                 160

His Asn Lys Asn Thr Leu Val Ile Ile Pro Ile Pro Asn Ala Arg Glu
                165                 170                 175

Phe Ser Asn Glu Ile Arg Val Arg Asn Ile Ser Ile Asn Lys Glu Ser
            180                 185                 190

Ser Tyr Glu Cys
        195
```

<210> 17
<211> 876
<212> DNA
<213> Ehrlichia chaffeensis

<400> 17

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agtgtatcgt tttcagaggt tacaaacagc agtattaaaa aacactctgg gttatatatt 120
agtggacaat acaaaccaag tgtttctgtt tttagtagtt tctcaattaa agaaactaac 180
actatcacaa aaaatcttat agcgttaaaa aaagatatta actctcttga agttaacgcc 240
gatgctagtc aaggtattag tcatccagga aattttacta taccttatat agcagcattt 300
gaagataatg cttttaattt caacggtgct attggttaca ttactgaagg tctaaggatt 360
gaaatagaag gttcctatga agaatttgat gctaaaaacc ctggaggtta tggtctaaat 420
gatgcctttc ggtactttgc tttagcacgt gatatggaaa gcaacaagtt ccaaccaaaa 480
gcacaaagct cacaaaaagt atttcacact gtaatgaaga gtgatgggtt atctataata 540
tctatcatgg ttaacggctg ttatgatttt tcttcggata atttattagt atcaccttat 600
atatgtggag gtataggtgt ggatgcaata gaatttttg acgcattaca cattaaactt 660
gcgtgccaaa gcaaattagg catcacttat caattatctt ataatatcag cttatttgct 720
gatggatatt atcatcaagt aataggtaac caattcagaa atttaaacgt tcaacatgta 780
gctgaactta atgatgcacc taaagttaca tctgcagttg ccacacttaa tgttggatat 840
ttcggcgctg aagttggagt aagatttata ttttaa                           876
```

<210> 18
<211> 291
<212> PRT
<213> Ehrlichia chaffeensis

<400> 18

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Met Asn Lys Lys Asn Lys Phe Ile Ile Ala Thr Ala Leu Val Tyr Leu
  1               5                  10                  15

Leu Ser Leu Pro Ser Val Ser Phe Ser Glu Val Thr Asn Ser Ser Ile
             20                  25                  30

Lys Lys His Ser Gly Leu Tyr Ile Ser Gly Gln Tyr Lys Pro Ser Val
         35                  40                  45

Ser Val Phe Ser Ser Phe Ser Ile Lys Glu Thr Asn Thr Ile Thr Lys
     50                  55                  60

Asn Leu Ile Ala Leu Lys Lys Asp Ile Asn Ser Leu Glu Val Asn Ala
 65                  70                  75                  80

Asp Ala Ser Gln Gly Ile Ser His Pro Gly Asn Phe Thr Ile Pro Tyr
                 85                  90                  95

Ile Ala Ala Phe Glu Asp Asn Ala Phe Asn Phe Asn Gly Ala Ile Gly
            100                 105                 110

Tyr Ile Thr Glu Gly Leu Arg Ile Glu Ile Glu Gly Ser Tyr Glu Glu
        115                 120                 125

Phe Asp Ala Lys Asn Pro Gly Gly Tyr Gly Leu Asn Asp Ala Phe Arg
    130                 135                 140

Tyr Phe Ala Leu Ala Arg Asp Met Glu Ser Asn Lys Phe Gln Pro Lys
145                 150                 155                 160

Ala Gln Ser Ser Gln Lys Val Phe His Thr Val Met Lys Ser Asp Gly
                165                 170                 175

Leu Ser Ile Ile Ser Ile Met Val Asn Gly Cys Tyr Asp Phe Ser Ser
            180                 185                 190

Asp Asn Leu Leu Val Ser Pro Tyr Ile Cys Gly Gly Ile Gly Val Asp
        195                 200                 205

Ala Ile Glu Phe Phe Asp Ala Leu His Ile Lys Leu Ala Cys Gln Ser
    210                 215                 220

Lys Leu Gly Ile Thr Tyr Gln Leu Ser Tyr Asn Ile Ser Leu Phe Ala
225                 230                 235                 240

Asp Gly Tyr Tyr His Gln Val Ile Gly Asn Gln Phe Arg Asn Leu Asn
                245                 250                 255
```

```
Val Gln His Val Ala Glu Leu Asn Asp Ala Pro Lys Val Thr Ser Ala
            260                 265                 270

Val Ala Thr Leu Asn Val Gly Tyr Phe Gly Ala Glu Val Gly Val Arg
        275                 280                 285

Phe Ile Phe
    290
```

<210> 19
<211> 396
<212> DNA
<213> Ehrlichia chaffeensis

<400> 19
tctagaatac atgatgaaaa ttatgctatt acaacaaata ataaattatc catcgcatct 60
attatggtta acacctgcta tgatatttca attaataata catcaatagt accgtattta 120
tgcacaggca ttggtgaaga tcttgtaggg ctttttaata caatacattt taaacttgca 180
tatcaaggga aagttggaat gagttatttg ataaataaca atatcctatt attttctgac 240
atatattatc ataaagtcat gggtaacaga tttaaaaatt tgtacatgca atatgtagct 300
gatcctaata tttctgaaga aactatacct atattagcaa aacttgatat tggttatttt 360
ggaagtgaaa ttggaataag gtttatgttt aactaa 396

<210> 20
<211> 131
<212> PRT
<213> Ehrlichia chaffeensis

<400> 20

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Ser Arg Ile His Asp Glu Asn Tyr Ala Ile Thr Thr Asn Asn Lys Leu
  1               5                  10                  15

Ser Ile Ala Ser Ile Met Val Asn Thr Cys Tyr Asp Ile Ser Ile Asn
             20                  25                  30

Asn Thr Ser Ile Val Pro Tyr Leu Cys Thr Gly Ile Gly Glu Asp Leu
         35                  40                  45

Val Gly Leu Phe Asn Thr Ile His Phe Lys Leu Ala Tyr Gln Gly Lys
     50                  55                  60

Val Gly Met Ser Tyr Leu Ile Asn Asn Asn Ile Leu Leu Phe Ser Asp
 65                  70                  75                  80

Ile Tyr Tyr His Lys Val Met Gly Asn Arg Phe Lys Asn Leu Tyr Met
                 85                  90                  95

Gln Tyr Val Ala Asp Pro Asn Ile Ser Glu Glu Thr Ile Pro Ile Leu
            100                 105                 110
```

```
Ala Lys Leu Asp Ile Gly Tyr Phe Gly Ser Glu Ile Gly Ile Arg Phe
        115                 120                 125

Met Phe Asn
    130
```

<210> 21
<211> 888
<212> DNA
<213> Ehrlichia chaffeensis

<400> 21
atgacaaaga aatttaattt tgtaaatgtt atattaacat ttttgttatt tcttttccca 60
cttaagtcat ttacaacata tgcaaataat aacacaatca ctcaaaaagt tggattgtac 120
ataagtggtc aatataagcc aagtattcct catttcaaga atttttcagt agaagaaaat 180
gacaaagtag tagatttgat aggtcttaca actgatgtta catatatcac agaacatata 240
ttacgagata atacaaaatt caacactcat tatattgcaa agttcaagaa caatttata 300
aatttcagca gtgcaattgg ttattattct gggcaaggac caaggttaga aatagaaagc 360
tcttatgggg attttgatgt tgtaaattat aaaaattatg cagtacaaga tgttaataga 420
tattttgctt tagtacgtga aaaaaatggt tcaaatttct ctccaaaacc acatgaaact 480
agtcaaccct ctgacagtaa tcctaaaaag tctttttata ctttaatgaa gaataatggg 540
gtatttgttg catcagtaat aatcaacggt tgttatgatt tttcttttaa taacacaaca 600
atatcacctt acgtatgtat aggagttgga ggagatttta tagagttttt tgaagtaatg 660
catatcaagt ttgcttgcca aagtaaggtt ggtattagct atccaatatc tccctctatt 720
actatttttg ctgatgcaca ttatcacaag gtcataaata ataaatttaa caacctacat 780
gttaagtatt catatgaact taaaaactca cctaccatta cctctgcaac agccaaacta 840
aacattgaat attttggtgg tgaagttggg atgagattta tattttaa 888

<210> 22
<211> 295
<212> PRT
<213> Ehrlichia chaffeensis

<400> 22
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Met Thr Lys Lys Phe Asn Phe Val Asn Val Ile Leu Thr Phe Leu Leu
  1               5                  10                  15

Phe Leu Phe Pro Leu Lys Ser Phe Thr Thr Tyr Ala Asn Asn Asn Thr
             20                  25                  30

Ile Thr Gln Lys Val Gly Leu Tyr Ile Ser Gly Gln Tyr Lys Pro Ser
         35                  40                  45

Ile Pro His Phe Lys Asn Phe Ser Val Glu Glu Asn Asp Lys Val Val
     50                  55                  60

Asp Leu Ile Gly Leu Thr Thr Asp Val Thr Tyr Ile Thr Glu His Ile
 65                  70                  75                  80

Leu Arg Asp Asn Thr Lys Phe Asn Thr His Tyr Ile Ala Lys Phe Lys
                 85                  90                  95
```

```
Asn Asn Phe Ile Asn Phe Ser Ser Ala Ile Gly Tyr Tyr Ser Gly Gln
            100                 105                 110

Gly Pro Arg Leu Glu Ile Glu Ser Ser Tyr Gly Asp Phe Asp Val Val
        115                 120                 125

Asn Tyr Lys Asn Tyr Ala Val Gln Asp Val Asn Arg Tyr Phe Ala Leu
    130                 135                 140

Val Arg Glu Lys Asn Gly Ser Asn Phe Ser Pro Lys Pro His Glu Thr
145                 150                 155                 160

Ser Gln Pro Ser Asp Ser Asn Pro Lys Lys Ser Phe Tyr Thr Leu Met
                165                 170                 175

Lys Asn Asn Gly Val Phe Val Ala Ser Val Ile Ile Asn Gly Cys Tyr
            180                 185                 190

Asp Phe Ser Phe Asn Asn Thr Thr Ile Ser Pro Tyr Val Cys Ile Gly
        195                 200                 205

Val Gly Gly Asp Phe Ile Glu Phe Phe Glu Val Met His Ile Lys Phe
    210                 215                 220

Ala Cys Gln Ser Lys Val Gly Ile Ser Tyr Pro Ile Ser Pro Ser Ile
225                 230                 235                 240

Thr Ile Phe Ala Asp Ala His Tyr His Lys Val Ile Asn Asn Lys Phe
                245                 250                 255

Asn Asn Leu His Val Lys Tyr Ser Tyr Glu Leu Lys Asn Ser Pro Thr
            260                 265                 270

Ile Thr Ser Ala Thr Ala Lys Leu Asn Ile Glu Tyr Phe Gly Gly Glu
        275                 280                 285

Val Gly Met Arg Phe Ile Phe
    290                 295
```

<210> 23
<211> 840
<212> DNA
<213> Ehrlichia chaffeensis

<400> 23
atgagcaaaa aaaagtttat tacaatagga acagtacttg catctctatt atcattctta 60
tctattgaat ccttttcagc tataaatcat aatcatacag gaaataacac tagtggtata 120
tatattacag ggcagtatag accaggagta tcccatttta gcaatttctc agtaaaagaa 180
actaatgttg atacaataca actagtagga tataaaaaaa gtgcgtcttc tatcgatcct 240
aacacttatt caaactttca aggtccatat actgttacat ttcaagataa tgctgctagt 300
ttcagtggag caattggata ttcttacccc gaaagtctaa gacttgaact tgaaggttct 360
tacgaaaaat ttgatgtcaa agatcctaaa gactactcag caaaagatgc ttttaggttt 420
tttgctctag cacgtaatac gtctactact gttcctgatg ctcaaaaata tacagttatg 480

aagaataatg gcttatctgt tgcatcaatc atgatcaatg gttgttatga tctatctttt 540
aataatttag tcgtatcacc ttatatatgt gcaggtattg gtgaagattt cattgaattt 600
tttgatactt tgcacattaa acttgcttat caaggaaaac taggtattag ttattacttc 660
tttcctaaga ttaatgtatt tgctggtggg tactatcata gagttatagg gaataaattt 720
aaaaatttaa atgttaacca tgttgttaca cttgatgaat ttcctaaagc aacttctgca 780
gtagctacac ttaatgttgc ttattttggt ggtgaagctg gagtaaagtt tacattttaa 840

<210> 24
<211> 279
<212> PRT
<213> Ehrlichia chaffeensis

<400> 24
Met Ser Lys Lys Lys Phe Ile Thr Ile Gly Thr Val Leu Ala Ser Leu
1 5 10 15

Leu Ser Phe Leu Ser Ile Glu Ser Phe Ser Ala Ile Asn His Asn His
20 25 30

Thr Gly Asn Asn Thr Ser Gly Ile Tyr Ile Thr Gly Gln Tyr Arg Pro
35 40 45

Gly Val Ser His Phe Ser Asn Phe Ser Val Lys Glu Thr Asn Val Asp
50 55 60

Thr Ile Gln Leu Val Gly Tyr Lys Lys Ser Ala Ser Ser Ile Asp Pro
65 70 75 80

Asn Thr Tyr Ser Asn Phe Gln Gly Pro Tyr Thr Val Thr Phe Gln Asp
85 90 95

Asn Ala Ala Ser Phe Ser Gly Ala Ile Gly Tyr Ser Tyr Pro Glu Ser
100 105 110

Leu Arg Leu Glu Leu Glu Gly Ser Tyr Glu Lys Phe Asp Val Lys Asp
115 120 125

Pro Lys Asp Tyr Ser Ala Lys Asp Ala Phe Arg Phe Phe Ala Leu Ala
130 135 140

Arg Asn Thr Ser Thr Thr Val Pro Asp Ala Gln Lys Tyr Thr Val Met
145 150 155 160

Lys Asn Asn Gly Leu Ser Val Ala Ser Ile Met Ile Asn Gly Cys Tyr
165 170 175

Asp Leu Ser Phe Asn Asn Leu Val Val Ser Pro Tyr Ile Cys Ala Gly
180 185 190

Ile Gly Glu Asp Phe Ile Glu Phe Phe Asp Thr Leu His Ile Lys Leu
195 200 205

```
Ala Tyr Gln Gly Lys Leu Gly Ile Ser Tyr Tyr Phe Phe Pro Lys Ile
    210                 215                 220

Asn Val Phe Ala Gly Gly Tyr Tyr His Arg Val Ile Gly Asn Lys Phe
225                 230                 235                 240

Lys Asn Leu Asn Val Asn His Val Val Thr Leu Asp Glu Phe Pro Lys
                245                 250                 255

Ala Thr Ser Ala Val Ala Thr Leu Asn Val Ala Tyr Phe Gly Gly Glu
            260                 265                 270

Ala Gly Val Lys Phe Thr Phe
        275
```

<210> 25
<211> 852
<212> DNA
<213> Ehrlichia chaffeensis

<400> 25
atgagtgcta aaaaaaagct ttttataata gggtcagtgt tagtatgttt agtgtcatac 60
ttacctacta aatctttgtc aaacttaaat aatattaata ataacactaa gtgcactggg 120
ctatatgtca gtggacaata taaacctact gtttctcact ttagtaattt ttcacttaaa 180
gaaacttata ctgacactaa agagttatta ggactagcaa aagatattaa gtctattaca 240
gatataacaa caaataaaaa attcaacatt ccttataaca caaaatttca agataatgct 300
gttagcttca gtgcagctgt tggatatatt tcccaagaca gtccaagggt tgaggtagaa 360
tggtcttatg aagaatttga cgttaaaaat cctggtaatt acgtagtaag tgaagccttc 420
aggtatattg ctttagcaag aggaattgat aatcttcaaa aatatcctga aacaaataag 480
tatgttgtta taaagaacaa tggcttatct gtcgcatcca ttataatcaa tggctgttat 540
gatttttctt taaacaattt aaaagtatca ccttacatat gcgtagggtt tggtggggac 600
attatagaat tttttagtgc tgtaagtttt aaatttgctt atcaaggtaa ggtaggtatc 660
agttatccat tattctctaa tatgattata tttgctgacg gatattacca taaggtcata 720
ggaaataaat ttaacaattt aaatgttcaa cacgttgtta gtcttaacag tcatcctaag 780
tctacttttg cagtagctac tcttaatgtt gagtatttcg gtagtgaatt tgggttaaaa 840
tttatatttt aa 852

<210> 26
<211> 283
<212> PRT
<213> Ehrlichia chaffeensis

<400> 26
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Met Ser Ala Lys Lys Lys Leu Phe Ile Ile Gly Ser Val Leu Val Cys
  1               5                  10                  15

Leu Val Ser Tyr Leu Pro Thr Lys Ser Leu Ser Asn Leu Asn Asn Ile
            20                  25                  30

Asn Asn Asn Thr Lys Cys Thr Gly Leu Tyr Val Ser Gly Gln Tyr Lys
        35                  40                  45
```

```
Pro Thr Val Ser His Phe Ser Asn Phe Ser Leu Lys Glu Thr Tyr Thr
     50                  55                  60

Asp Thr Lys Glu Leu Leu Gly Leu Ala Lys Asp Ile Lys Ser Ile Thr
 65                  70                  75                  80

Asp Ile Thr Thr Asn Lys Lys Phe Asn Ile Pro Tyr Asn Thr Lys Phe
                 85                  90                  95

Gln Asp Asn Ala Val Ser Phe Ser Ala Ala Val Gly Tyr Ile Ser Gln
            100                 105                 110

Asp Ser Pro Arg Val Glu Val Glu Trp Ser Tyr Glu Glu Phe Asp Val
        115                 120                 125

Lys Asn Pro Gly Asn Tyr Val Val Ser Glu Ala Phe Arg Tyr Ile Ala
    130                 135                 140

Leu Ala Arg Gly Ile Asp Asn Leu Gln Lys Tyr Pro Glu Thr Asn Lys
145                 150                 155                 160

Tyr Val Val Ile Lys Asn Asn Gly Leu Ser Val Ala Ser Ile Ile Ile
                165                 170                 175

Asn Gly Cys Tyr Asp Phe Ser Leu Asn Asn Leu Lys Val Ser Pro Tyr
            180                 185                 190

Ile Cys Val Gly Phe Gly Gly Asp Ile Ile Glu Phe Phe Ser Ala Val
        195                 200                 205

Ser Phe Lys Phe Ala Tyr Gln Gly Lys Val Gly Ile Ser Tyr Pro Leu
    210                 215                 220

Phe Ser Asn Met Ile Ile Phe Ala Asp Gly Tyr Tyr His Lys Val Ile
225                 230                 235                 240

Gly Asn Lys Phe Asn Asn Leu Asn Val Gln His Val Val Ser Leu Asn
                245                 250                 255

Ser His Pro Lys Ser Thr Phe Ala Val Ala Thr Leu Asn Val Glu Tyr
            260                 265                 270

Phe Gly Ser Glu Phe Gly Leu Lys Phe Ile Phe
        275                 280
```

<210> 27
<211> 828
<212> DNA
<213> Ehrlichia chaffeensis

<400> 27
atgagtaaaa aaaattttat tacaatagga gcaacactta ttcatatgtt gttacctaac 60
atatcttttc cagaaactat taacaataac actgataaac tttctgggtt atatataagt 120

gggcaatata aaccagggat ttctcatttc agcaaatttt cagtcaaaga aatctataat 180
gataacattc aactaattgg gttaagacac aacgcaattt ctactagtac ccttaatatt 240
aatacagatt ttaatatccc ctataaagta acatttcaaa ataacattac cagctttagt 300
ggagctattg gttattctga tcccacaggg gcaagatttg agcttgaagg ttcttatgaa 360
gaatttgatg tgacagatcc tggagactgc ttaataaaag atacctatag atatttcgct 420
ttagctagaa acccatcagg ttctagccct acctcaaaca actatactgt tatgagaaat 480
gatggtgttt ccattacttc tgttatattt aatggctgtt atgacatctt tttaaaggat 540
ttagaagtat caccttatgt atgtgttggt gtaggtggag attttataga attttttgac 600
gcattacaca ttaaattagc ataccaaggc aagttaggta tcaattatca cttatcgact 660
caagcaagcg tatttattga tggatattat cataaggtta taggaaatca attcaacaat 720
ctaaatgttc aacacgtggc tagtacagat tttggacctg tatacgcagt agccacactt 780
aacattggtt attttggtgg tgaaatcgga attagactta cattttaa 828

<210> 28
<211> 275
<212> PRT
<213> Ehrlichia chaffeensis

<400> 28
Met Ser Lys Lys Asn Phe Ile Thr Ile Gly Ala Thr Leu Ile His Met
1 5 10 15

Leu Leu Pro Asn Ile Ser Phe Pro Glu Thr Ile Asn Asn Asn Thr Asp
20 25 30

Lys Leu Ser Gly Leu Tyr Ile Ser Gly Gln Tyr Lys Pro Gly Ile Ser
35 40 45

His Phe Ser Lys Phe Ser Val Lys Glu Ile Tyr Asn Asp Asn Ile Gln
50 55 60

Leu Ile Gly Leu Arg His Asn Ala Ile Ser Thr Ser Thr Leu Asn Ile
65 70 75 80

Asn Thr Asp Phe Asn Ile Pro Tyr Lys Val Thr Phe Gln Asn Asn Ile
85 90 95

Thr Ser Phe Ser Gly Ala Ile Gly Tyr Ser Asp Pro Thr Gly Ala Arg
100 105 110

Phe Glu Leu Glu Gly Ser Tyr Glu Glu Phe Asp Val Thr Asp Pro Gly
115 120 125

Asp Cys Leu Ile Lys Asp Thr Tyr Arg Tyr Phe Ala Leu Ala Arg Asn
130 135 140

Pro Ser Gly Ser Ser Pro Thr Ser Asn Asn Tyr Thr Val Met Arg Asn
145 150 155 160

Asp Gly Val Ser Ile Thr Ser Val Ile Phe Asn Gly Cys Tyr Asp Ile
165 170 175

```
Phe Leu Lys Asp Leu Glu Val Ser Pro Tyr Val Cys Val Gly Val Gly
            180                 185                 190

Gly Asp Phe Ile Glu Phe Phe Asp Ala Leu His Ile Lys Leu Ala Tyr
        195                 200                 205

Gln Gly Lys Leu Gly Ile Asn Tyr His Leu Ser Thr Gln Ala Ser Val
    210                 215                 220

Phe Ile Asp Gly Tyr Tyr His Lys Val Ile Gly Asn Gln Phe Asn Asn
225                 230                 235                 240

Leu Asn Val Gln His Val Ala Ser Thr Asp Phe Gly Pro Val Tyr Ala
                245                 250                 255

Val Ala Thr Leu Asn Ile Gly Tyr Phe Gly Gly Glu Ile Gly Ile Arg
            260                 265                 270

Leu Thr Phe
        275
```

<210> 29
<211> 858
<212> DNA
<213> Ehrlichia chaffeensis

<400> 29

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atgaataata gaaaaagttt ttttataata ggtgcatcat tactagcaag cttattattc 60
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tatatcagtg gacaatatag accaggagtt tctcatttta gcaaattttc agtcaaagaa 180
accaactaca atactactca actagttggg cttaaaaagg acatcagtgt catagggaac 240
agtaatatca caacctacac aaatttcaac tttccttaca ttgcagaatt tcaagacaat 300
gccataagtt tcagtggggc aattggatac ttgtattccg agaattttag aattgaagta 360
gaggcttctt atgaagaatt tgatgttaaa aatccagaag gatctgctac agacgcatac 420
aggtattttg cactagcacg tgctatggat ggcactaata aatctagtcc tgatgacaca 480
agaaaattca ctgtcatgag aaatgacggg ttatcaattt catcagtaat gataaatggg 540
tgttacaatt ttacattaga tgatatacca gtagtaccgt atgtatgcgc aggaatagga 600
ggagatttca tagagttttt taatgattta catgttaagt ttcgtcatca aggcaaggta 660
ggtattagtt attctatatc ccctgaagta agtttatttc ttaacggata ttaccataaa 720
gtaacaggta acagatttaa aaacttacac gttcaacacg taagtgattt aagtgacgct 780
cctaagttca catctgcagt tgctacactc aatgttgggt actttggtgg cgaaattgga 840
gtaagattta tattttaa                                              858
```

<210> 30
<211> 285
<212> PRT
<213> Ehrlichia chaffeensis

<400> 30

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Met Asn Asn Arg Lys Ser Phe Phe Ile Ile Gly Ala Ser Leu Leu Ala
  1               5                  10                  15
```

```
Ser Leu Leu Phe Thr Ser Glu Ala Ser Ser Thr Gly Asn Val Ser Asn
            20                  25                  30

His Thr Tyr Phe Lys Pro Arg Leu Tyr Ile Ser Gly Gln Tyr Arg Pro
        35                  40                  45

Gly Val Ser His Phe Ser Lys Phe Ser Val Lys Glu Thr Asn Tyr Asn
    50                  55                  60

Thr Thr Gln Leu Val Gly Leu Lys Lys Asp Ile Ser Val Ile Gly Asn
65                  70                  75                  80

Ser Asn Ile Thr Thr Tyr Thr Asn Phe Asn Phe Pro Tyr Ile Ala Glu
                85                  90                  95

Phe Gln Asp Asn Ala Ile Ser Phe Ser Gly Ala Ile Gly Tyr Leu Tyr
            100                 105                 110

Ser Glu Asn Phe Arg Ile Glu Val Glu Ala Ser Tyr Glu Glu Phe Asp
        115                 120                 125

Val Lys Asn Pro Glu Gly Ser Ala Thr Asp Ala Tyr Arg Tyr Phe Ala
    130                 135                 140

Leu Ala Arg Ala Met Asp Gly Thr Asn Lys Ser Ser Pro Asp Asp Thr
145                 150                 155                 160

Arg Lys Phe Thr Val Met Arg Asn Asp Gly Leu Ser Ile Ser Ser Val
                165                 170                 175

Met Ile Asn Gly Cys Tyr Asn Phe Thr Leu Asp Asp Ile Pro Val Val
            180                 185                 190

Pro Tyr Val Cys Ala Gly Ile Gly Gly Asp Phe Ile Glu Phe Phe Asn
        195                 200                 205

Asp Leu His Val Lys Phe Arg His Gln Gly Lys Val Gly Ile Ser Tyr
    210                 215                 220

Ser Ile Ser Pro Glu Val Ser Leu Phe Leu Asn Gly Tyr Tyr His Lys
225                 230                 235                 240

Val Thr Gly Asn Arg Phe Lys Asn Leu His Val Gln His Val Ser Asp
                245                 250                 255

Leu Ser Asp Ala Pro Lys Phe Thr Ser Ala Val Ala Thr Leu Asn Val
            260                 265                 270

Gly Tyr Phe Gly Gly Glu Ile Gly Val Arg Phe Ile Phe
        275                 280                 285
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<210> 31
<211> 867
<212> DNA
<213> Ehrlichia canis

<400> 31
atgaattgca aaagattttt catagcaagt gcattgatat cactaatgtc tttcttacct 60
agcgtatctt tttctgaatc aatacatgaa gataatataa atggtaactt ttacattagt 120
gcaaagtata tgccaagtgc ctcacacttt ggcgtatttt cagttaaaga agagaaaaac 180
acaacaactg gagttttcgg attaaaacaa gattgggacg gagcaacaat aaaggatgca 240
agcagcagcc acacaataga cccaagtaca atattctcca tttcaaatta ttcatttaaa 300
tatgaaaaca atccattttt agggtttgca ggagctattg gctactcaat gggtggtcca 360
agggtagagt ttgaagtgtc ttacgaaata tttgatgtaa aaaaccaagg taacagttac 420
aagaacgatg ctcacaaata ttgcgcttta tcaagacaca ccggaggtat gccacaagcc 480
ggtcatcaaa ataaatttgt cttcctaaaa aatgaaggat tacttgacat atcacttatg 540
ataaacgcat gttatgatat aacaatcgac agcatgccat tttctccata tatatgtgca 600
ggtattggta gtgacttagt ttcgatgttt gaaactacaa atcctaaaat ttcttatcaa 660
ggaaaattag gtgtaagtta ctccataagc ccagaagcat ctgtttttgt tggaggacac 720
tttcacagag ttataggtaa tgaatttaaa gacattcctg caataactcc tgctggagca 780
acagaaatta aaggcacaca gtttacaaca gtaacattaa acatatgcca cttcggacta 840
gagcttggag gcaggtttac tttttaa 867

<210> 32
<211> 288
<212> PRT
<213> Ehrlichia canis

<400> 32
Met Asn Cys Lys Arg Phe Phe Ile Ala Ser Ala Leu Ile Ser Leu Met
1 5 10 15

Ser Phe Leu Pro Ser Val Ser Phe Ser Glu Ser Ile His Glu Asp Asn
20 25 30

Ile Asn Gly Asn Phe Tyr Ile Ser Ala Lys Tyr Met Pro Ser Ala Ser
35 40 45

His Phe Gly Val Phe Ser Val Lys Glu Glu Lys Asn Thr Thr Thr Gly
50 55 60

Val Phe Gly Leu Lys Gln Asp Trp Asp Gly Ala Thr Ile Lys Asp Ala
65 70 75 80

Ser Ser Ser His Thr Ile Asp Pro Ser Thr Ile Phe Ser Ile Ser Asn
85 90 95

Tyr Ser Phe Lys Tyr Glu Asn Asn Pro Phe Leu Gly Phe Ala Gly Ala
100 105 110

Ile Gly Tyr Ser Met Gly Gly Pro Arg Val Glu Phe Glu Val Ser Tyr
115 120 125

Glu Ile Phe Asp Val Lys Asn Gln Gly Asn Ser Tyr Lys Asn Asp Ala
130 135 140

His Lys Tyr Cys Ala Leu Ser Arg His Thr Gly Gly Met Pro Gln Ala
145 150 155 160

Gly His Gln Asn Lys Phe Val Phe Leu Lys Asn Glu Gly Leu Leu Asp
165 170 175

Ile Ser Leu Met Ile Asn Ala Cys Tyr Asp Ile Thr Ile Asp Ser Met
180 185 190

Pro Phe Ser Pro Tyr Ile Cys Ala Gly Ile Gly Ser Asp Leu Val Ser
195 200 205

Met Phe Glu Thr Thr Asn Pro Lys Ile Ser Tyr Gln Gly Lys Leu Gly
210 215 220

Val Ser Tyr Ser Ile Ser Pro Glu Ala Ser Val Phe Val Gly Gly His
225 230 235 240

Phe His Arg Val Ile Gly Asn Glu Phe Lys Asp Ile Pro Ala Ile Thr
245 250 255

Pro Ala Gly Ala Thr Glu Ile Lys Gly Thr Gln Phe Thr Thr Val Thr
260 265 270

Leu Asn Ile Cys His Phe Gly Leu Glu Leu Gly Gly Arg Phe Thr Phe
275 280 285

<210> 33
<211> 864
<212> DNA
<213> Ehrlichia chaffeensis

<400> 33
atgaaatata aaaaaacttt tacagtaact gcattagtat tattaacttc ctttacacat 60
tttatacctt tttatagtcc agcacgtgcc agtacaattc acaacttcta cattagtgga 120
aaatatatgc caacagcgtc acattttgga atttttttcag ctaaagaaga acaaagtttt 180
actaaggtat tagttgggtt agatcaacga ttatcacata atattataaa caataatgat 240
acagcaaaga gtcttaaggt tcaaaattat tcatttaaat acaaaaataa cccatttcta 300
ggatttgcaa gagctattgg ttattcaata ggcaattcaa gaatagaact agaagtatca 360
catgaaatat ttgatactaa aaacccagga aacaattatt taaatgactc tcacaaatat 420
tgcgctttat ctcatggaag tcacatatgc agtgatggaa atagcggaga ttggtacact 480
gcaaaaactg ataagtttgt acttctgaaa aatgaaggtt tacttgacgt ctcatttatg 540
ttaaacgcat gttatgacat aacaactgaa aaaatgcctt tttcacctta tatatgtgca 600
ggtattggta ctgatctcat atctatgttt gagacaacac aaaacaaaat atcttatcaa 660
ggaaagttag gtttaaacta tactataaac tcaagagttt ctgtttttgc aggtgggcac 720
tttcataaag taataggtaa tgaatttaaa ggtattccta ctctattacc tgatggatca 780
aacattaaag tacaacagtc tgcaacagta acattagatg tgtgccattt cgggttagag 840
attggaagta gatttttctt ttaa 864

<210> 34
<211> 287
<212> PRT
<213> Ehrlichia chaffeensis

<400> 34

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Met Lys Tyr Lys Lys Thr Phe Thr Val Thr Ala Leu Val Leu Leu Thr
  1               5                  10                  15

Ser Phe Thr His Phe Ile Pro Phe Tyr Ser Pro Ala Arg Ala Ser Thr
             20                  25                  30

Ile His Asn Phe Tyr Ile Ser Gly Lys Tyr Met Pro Thr Ala Ser His
         35                  40                  45

Phe Gly Ile Phe Ser Ala Lys Glu Glu Gln Ser Phe Thr Lys Val Leu
     50                  55                  60

Val Gly Leu Asp Gln Arg Leu Ser His Asn Ile Ile Asn Asn Asn Asp
 65                  70                  75                  80

Thr Ala Lys Ser Leu Lys Val Gln Asn Tyr Ser Phe Lys Tyr Lys Asn
                 85                  90                  95

Asn Pro Phe Leu Gly Phe Ala Arg Ala Ile Gly Tyr Ser Ile Gly Asn
            100                 105                 110

Ser Arg Ile Glu Leu Glu Val Ser His Glu Ile Phe Asp Thr Lys Asn
        115                 120                 125

Pro Gly Asn Asn Tyr Leu Asn Asp Ser His Lys Tyr Cys Ala Leu Ser
    130                 135                 140

His Gly Ser His Ile Cys Ser Asp Gly Asn Ser Gly Asp Trp Tyr Thr
145                 150                 155                 160

Ala Lys Thr Asp Lys Phe Val Leu Leu Lys Asn Glu Gly Leu Leu Asp
                165                 170                 175

Val Ser Phe Met Leu Asn Ala Cys Tyr Asp Ile Thr Thr Glu Lys Met
            180                 185                 190

Pro Phe Ser Pro Tyr Ile Cys Ala Gly Ile Gly Thr Asp Leu Ile Ser
        195                 200                 205

Met Phe Glu Thr Thr Gln Asn Lys Ile Ser Tyr Gln Gly Lys Leu Gly
    210                 215                 220

Leu Asn Tyr Thr Ile Asn Ser Arg Val Ser Val Phe Ala Gly Gly His
225                 230                 235                 240

Phe His Lys Val Ile Gly Asn Glu Phe Lys Gly Ile Pro Thr Leu Leu
                245                 250                 255
```

```
Pro Asp Gly Ser Asn Ile Lys Val Gln Gln Ser Ala Thr Val Thr Leu
            260                 265                 270

Asp Val Cys His Phe Gly Leu Glu Ile Gly Ser Arg Phe Phe Phe
        275                 280                 285
```

<210> 35
<211> 924
<212> DNA
<213> Ehrlichia canis

<400> 35
atgttttata ctaatatata tattctggct tgtatttact ttgcacttcc actattgtta 60
atttattttc actattttag gtgtaatatg aattgcaaaa aaattcttat aacaactgca 120
ttaatatcat taatgtactc tattccaagc atatcttttt ctgatactat acaagatggt 180
aacatgggtg gtaacttcta tattagtgga aagtatgtac caagtgtctc acattttggt 240
agcttctcag ctaaagaaga aagcaaatca actgttggag tttttggatt aaaacatgat 300
tgggatggaa gtccaatact taagaataaa cacgctgact ttactgttcc aaactattcg 360
ttcagatacg agaacaatcc atttctaggg tttgcaggag ctatcggtta ctcaatgggt 420
ggcccaagaa tagaattcga aatatcttat gaagcattcg acgtaaaaag tcctaatatc 480
aattatcaaa atgacgcgca caggtactgc gctctatctc atcacacatc ggcagccatg 540
gaagctgata aatttgtctt cttaaaaaac gaagggttaa ttgacatatc acttgcaata 600
aatgcatgtt atgatataat aaatgacaaa gtacctgttt ctccttatat atgcgcaggt 660
attggtactg atttgatttc tatgtttgaa gctacaagtc ctaaaatttc ctaccaagga 720
aaactgggca ttagttactc tattaatccg gaaacctctg ttttcatcgg tgggcatttc 780
cacaggatca taggtaatga gtttagagat attcctgcaa tagtacctag taactcaact 840
acaataagtg gaccacaatt tgcaacagta acactaaatg tgtgtcactt tggtttagaa 900
cttggaggaa gatttaactt ctaa 924

<210> 36
<211> 307
<212> PRT
<213> Ehrlichia canis

<400> 36
```
Met Phe Tyr Thr Asn Ile Tyr Ile Leu Ala Cys Ile Tyr Phe Ala Leu
  1               5                  10                  15

Pro Leu Leu Leu Ile Tyr Phe His Tyr Phe Arg Cys Asn Met Asn Cys
            20                  25                  30

Lys Lys Ile Leu Ile Thr Thr Ala Leu Ile Ser Leu Met Tyr Ser Ile
        35                  40                  45

Pro Ser Ile Ser Phe Ser Asp Thr Ile Gln Asp Gly Asn Met Gly Gly
    50                  55                  60

Asn Phe Tyr Ile Ser Gly Lys Tyr Val Pro Ser Val Ser His Phe Gly
65                  70                  75                  80
```

Ser Phe Ser Ala Lys Glu Glu Ser Lys Ser Thr Val Gly Val Phe Gly
85 90 95

Leu Lys His Asp Trp Asp Gly Ser Pro Ile Leu Lys Asn Lys His Ala
100 105 110

Asp Phe Thr Val Pro Asn Tyr Ser Phe Arg Tyr Glu Asn Asn Pro Phe
115 120 125

Leu Gly Phe Ala Gly Ala Ile Gly Tyr Ser Met Gly Gly Pro Arg Ile
130 135 140

Glu Phe Glu Ile Ser Tyr Glu Ala Phe Asp Val Lys Ser Pro Asn Ile
145 150 155 160

Asn Tyr Gln Asn Asp Ala His Arg Tyr Cys Ala Leu Ser His His Thr
165 170 175

Ser Ala Ala Met Glu Ala Asp Lys Phe Val Phe Leu Lys Asn Glu Gly
180 185 190

Leu Ile Asp Ile Ser Leu Ala Ile Asn Ala Cys Tyr Asp Ile Ile Asn
195 200 205

Asp Lys Val Pro Val Ser Pro Tyr Ile Cys Ala Gly Ile Gly Thr Asp
210 215 220

Leu Ile Ser Met Phe Glu Ala Thr Ser Pro Lys Ile Ser Tyr Gln Gly
225 230 235 240

Lys Leu Gly Ile Ser Tyr Ser Ile Asn Pro Glu Thr Ser Val Phe Ile
245 250 255

Gly Gly His Phe His Arg Ile Ile Gly Asn Glu Phe Arg Asp Ile Pro
260 265 270

Ala Ile Val Pro Ser Asn Ser Thr Thr Ile Ser Gly Pro Gln Phe Ala
275 280 285

Thr Val Thr Leu Asn Val Cys His Phe Gly Leu Glu Leu Gly Gly Arg
290 295 300

Phe Asn Phe
305

<210> 37
<211> 843
<212> DNA
<213> Ehrlichia canis

<400> 37
atgaattgca aaaaaattct tataacaact gcattaatgt cattaatgta ctatgctcca 60
agcatatctt tttctgatac tatacaagac gataacactg gtagcttcta catcagtgga 120

```
aaatatgtac caagtgtttc acattttggt gttttctcag ctaaagaaga aagaaactca 180
actgttggag tttttggatt aaaacatgat tggaatggag gtacaatatc taactcttct 240
ccagaaaata tattcacagt tcaaaattat tcgtttaaat acgaaaacaa cccattctta 300
gggtttgcag gagctattgg ttattcaatg ggtggcccaa gaatagaact tgaagttctg 360
tacgagacat tcgatgtgaa aaatcagaac aataattata agaacggcgc acacagatac 420
tgtgctttat ctcatcatag ttcagcaaca aacatgtcct ccgcaagtaa caaatttgtt 480
ttcttaaaaa atgaagggtt aattgactta tcatttatga taaatgcatg ctatgacata 540
ataattgaag gaatgccttt ttcaccttat atttgtgcag gtgttggtac tgatgttgtt 600
tccatgtttg aagctataaa tcctaaaatt tcttaccaag gaaaactagg attaggttat 660
agtataagtt cagaagcctc tgtttttatc ggtggacact ttcacagagt cataggtaat 720
gaatttagag acatcccctgc tatggttcct agtggatcaa atcttccaga aaaccaattt 780
gcaatagtaa cactaaatgt gtgtcacttt ggtttagaac ttggaggaag atttaacttc 840
tga                                                               843
```

<210> 38
<211> 280
<212> PRT
<213> Ehrlichia canis

<400> 38

```
Met Asn Cys Lys Lys Ile Leu Ile Thr Thr Ala Leu Met Ser Leu Met
  1               5                  10                  15

Tyr Tyr Ala Pro Ser Ile Ser Phe Ser Asp Thr Ile Gln Asp Asp Asn
             20                  25                  30

Thr Gly Ser Phe Tyr Ile Ser Gly Lys Tyr Val Pro Ser Val Ser His
         35                  40                  45

Phe Gly Val Phe Ser Ala Lys Glu Glu Arg Asn Ser Thr Val Gly Val
     50                  55                  60

Phe Gly Leu Lys His Asp Trp Asn Gly Gly Thr Ile Ser Asn Ser Ser
 65                  70                  75                  80

Pro Glu Asn Ile Phe Thr Val Gln Asn Tyr Ser Phe Lys Tyr Glu Asn
                 85                  90                  95

Asn Pro Phe Leu Gly Phe Ala Gly Ala Ile Gly Tyr Ser Met Gly Gly
            100                 105                 110

Pro Arg Ile Glu Leu Glu Val Leu Tyr Glu Thr Phe Asp Val Lys Asn
        115                 120                 125

Gln Asn Asn Asn Tyr Lys Asn Gly Ala His Arg Tyr Cys Ala Leu Ser
    130                 135                 140

His His Ser Ser Ala Thr Asn Met Ser Ser Ala Ser Asn Lys Phe Val
145                 150                 155                 160

Phe Leu Lys Asn Glu Gly Leu Ile Asp Leu Ser Phe Met Ile Asn Ala
                165                 170                 175
```

```
Cys Tyr Asp Ile Ile Ile Glu Gly Met Pro Phe Ser Pro Tyr Ile Cys
            180                 185                 190

Ala Gly Val Gly Thr Asp Val Val Ser Met Phe Glu Ala Ile Asn Pro
        195                 200                 205

Lys Ile Ser Tyr Gln Gly Lys Leu Gly Leu Gly Tyr Ser Ile Ser Ser
    210                 215                 220

Glu Ala Ser Val Phe Ile Gly Gly His Phe His Arg Val Ile Gly Asn
225                 230                 235                 240

Glu Phe Arg Asp Ile Pro Ala Met Val Pro Ser Gly Ser Asn Leu Pro
                245                 250                 255

Glu Asn Gln Phe Ala Ile Val Thr Leu Asn Val Cys His Phe Gly Leu
            260                 265                 270

Glu Leu Gly Gly Arg Phe Asn Phe
        275                 280
```

<210> 39
<211> 852
<212> DNA
<213> Ehrlichia canis

<400> 39

```
atgaattgta aaaaagtttt cacaataagt gcattgatat catccatata cttcctacct 60
aatgtctcat actctaaccc agtatatggt aacagtatgt atggtaattt ttacatatca 120
ggaaagtaca tgccaagtgt tcctcatttt ggaatttttt cagctgaaga agagaaaaaa 180
aagacaactg tagtatatgg cttaaaagga aaactggcag gagatgcaat atctagtcaa 240
agtccagatg ataattttac cattcgaaat tactcattca agtatgcaag caacaagttt 300
ttagggtttg cagtagctat tggttactcg ataggcagtc caagaataga agttgagatg 360
tcttatgaag catttgatgt gaaaaatcca ggtgataatt acaaaaacgg tgcttacagg 420
tattgtgctt tatctcatca agatgatgcg gatgatgaca tgactagtgc aactgacaaa 480
tttgtatatt taattaatga aggattactt aacatatcat ttatgacaaa catatgttat 540
gaaacagcaa gcaaaaatat acctctctct ccttacatat gtgcaggtat tggtactgat 600
ttaattcaca tgtttgaaac tacacatcct aaaatttctt atcaaggaaa gctagggttg 660
gcctacttcg taagtgcaga gtcttcggtt tcttttggta tatattttca taaaattata 720
aataataagt ttaaaaatgt tccagccatg gtacctatta actcagacga gatagtagga 780
ccacagtttg caacagtaac attaaatgta tgctactttg gattagaact tggatgtagg 840
ttcaacttct aa                                                    852
```

<210> 40
<211> 283
<212> PRT
<213> Ehrlichia canis

<400> 40

```
Met Asn Cys Lys Lys Val Phe Thr Ile Ser Ala Leu Ile Ser Ser Ile
  1               5                  10                  15
```

```
Tyr Phe Leu Pro Asn Val Ser Tyr Ser Asn Pro Val Tyr Gly Asn Ser
            20                  25                  30

Met Tyr Gly Asn Phe Tyr Ile Ser Gly Lys Tyr Met Pro Ser Val Pro
        35                  40                  45

His Phe Gly Ile Phe Ser Ala Glu Glu Glu Lys Lys Lys Thr Thr Val
    50                  55                  60

Val Tyr Gly Leu Lys Gly Lys Leu Ala Gly Asp Ala Ile Ser Ser Gln
65                  70                  75                  80

Ser Pro Asp Asp Asn Phe Thr Ile Arg Asn Tyr Ser Phe Lys Tyr Ala
                85                  90                  95

Ser Asn Lys Phe Leu Gly Phe Ala Val Ala Ile Gly Tyr Ser Ile Gly
            100                 105                 110

Ser Pro Arg Ile Glu Val Glu Met Ser Tyr Glu Ala Phe Asp Val Lys
        115                 120                 125

Asn Pro Gly Asp Asn Tyr Lys Asn Gly Ala Tyr Arg Tyr Cys Ala Leu
    130                 135                 140

Ser His Gln Asp Asp Ala Asp Asp Asp Met Thr Ser Ala Thr Asp Lys
145                 150                 155                 160

Phe Val Tyr Leu Ile Asn Glu Gly Leu Leu Asn Ile Ser Phe Met Thr
                165                 170                 175

Asn Ile Cys Tyr Glu Thr Ala Ser Lys Asn Ile Pro Leu Ser Pro Tyr
            180                 185                 190

Ile Cys Ala Gly Ile Gly Thr Asp Leu Ile His Met Phe Glu Thr Thr
        195                 200                 205

His Pro Lys Ile Ser Tyr Gln Gly Lys Leu Gly Leu Ala Tyr Phe Val
    210                 215                 220

Ser Ala Glu Ser Ser Val Ser Phe Gly Ile Tyr Phe His Lys Ile Ile
225                 230                 235                 240

Asn Asn Lys Phe Lys Asn Val Pro Ala Met Val Pro Ile Asn Ser Asp
                245                 250                 255

Glu Ile Val Gly Pro Gln Phe Ala Thr Val Thr Leu Asn Val Cys Tyr
            260                 265                 270

Phe Gly Leu Glu Leu Gly Cys Arg Phe Asn Phe
        275                 280
```

<210> 41
<211> 831
<212> DNA
<213> Ehrlichia canis

<400> 41
atgaactgta aaaaatttct tataacaact acattggtat cactaacaat tcttttacct 60
ggcatatctt tctccaaacc aatacatgaa aacaatacta caggaaactt ttacattatt 120
ggaaaatatg taccaagtat ttcacatttt gggaactttt cagctaaaga agaaaaaaac 180
acaactactg gaatttttgg attaaaagaa tcatggactg gtggtatcat ccttgataaa 240
gaacatgcag cttttaatat cccaaattat tcatttaaat atgaaaataa tccattttta 300
ggatttgcag gggtaattgg ctattcaata ggtagtccaa gaatagaatt tgaagtatca 360
tacgagacat tcgatgtaca aaatccagga gataagttta acaatgatgc acataagtat 420
tgtgctttat ccaatgattc cagtaaaaca atgaaaagtg gtaaattcgt ttttctcaaa 480
aatgaaggat taagtgacat atcactcatg ttaaatgtat gttatgatat aataaacaaa 540
agaatgcctt tttcacctta catatgtgca ggcattggta ctgacttaat attcatgttt 600
gacgctataa accataaagc tgcttatcaa ggaaaattag gttttaatta tccaataagc 660
ccagaagcta acatttctat gggtgtgcac tttcacaaag taacaaacaa cgagtttaga 720
gttcctgttc tattaactgc tggaggactc gctccagata atctatttgc aatagtaaag 780
ttgagtatat gtcattttgg gttagaattt gggtacaggg tcagttttta a 831

<210> 42
<211> 276
<212> PRT
<213> Ehrlichia canis

<400> 42
Met Asn Cys Lys Lys Phe Leu Ile Thr Thr Thr Leu Val Ser Leu Thr
1 5 10 15

Ile Leu Leu Pro Gly Ile Ser Phe Ser Lys Pro Ile His Glu Asn Asn
20 25 30

Thr Thr Gly Asn Phe Tyr Ile Ile Gly Lys Tyr Val Pro Ser Ile Ser
35 40 45

His Phe Gly Asn Phe Ser Ala Lys Glu Glu Lys Asn Thr Thr Thr Gly
50 55 60

Ile Phe Gly Leu Lys Glu Ser Trp Thr Gly Gly Ile Ile Leu Asp Lys
65 70 75 80

Glu His Ala Ala Phe Asn Ile Pro Asn Tyr Ser Phe Lys Tyr Glu Asn
85 90 95

Asn Pro Phe Leu Gly Phe Ala Gly Val Ile Gly Tyr Ser Ile Gly Ser
100 105 110

Pro Arg Ile Glu Phe Glu Val Ser Tyr Glu Thr Phe Asp Val Gln Asn
115 120 125

Pro Gly Asp Lys Phe Asn Asn Asp Ala His Lys Tyr Cys Ala Leu Ser
130 135 140

```
Asn Asp Ser Ser Lys Thr Met Lys Ser Gly Lys Phe Val Phe Leu Lys
145                 150                 155                 160

Asn Glu Gly Leu Ser Asp Ile Ser Leu Met Leu Asn Val Cys Tyr Asp
                165                 170                 175

Ile Ile Asn Lys Arg Met Pro Phe Ser Pro Tyr Ile Cys Ala Gly Ile
            180                 185                 190

Gly Thr Asp Leu Ile Phe Met Phe Asp Ala Ile Asn His Lys Ala Ala
        195                 200                 205

Tyr Gln Gly Lys Leu Gly Phe Asn Tyr Pro Ile Ser Pro Glu Ala Asn
    210                 215                 220

Ile Ser Met Gly Val His Phe His Lys Val Thr Asn Asn Glu Phe Arg
225                 230                 235                 240

Val Pro Val Leu Leu Thr Ala Gly Gly Leu Ala Pro Asp Asn Leu Phe
                245                 250                 255

Ala Ile Val Lys Leu Ser Ile Cys His Phe Gly Leu Glu Phe Gly Tyr
            260                 265                 270

Arg Val Ser Phe
        275
```

<210> 43
<211> 882
<212> DNA
<213> Ehrlichia canis

<400> 43

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atgaataata aactcaaatt tactataata aacacagtat tagtatgctt attgtcatta 60
cctaatatat cttcctcaaa ggccataaac aataacgcta aaaagtacta cggattatat 120
atcagtggac aatataaacc cagtgtttct gttttcagta atttttcagt taaagaaacc 180
aatgtcataa ctaaaaacct tatagcttta aaaaaagatg ttgactctat tgaaaccaag 240
actgatgcca gtgtaggtat tagtaaccca tcaaatttta ctatccccta tacagctgta 300
tttcaagata attctgtcaa tttcaatgga actattggtt acacctttgc tgaaggtaca 360
agagttgaaa tagaaggttc ttatgaggaa tttgatgtta aaaaccctgg aggctataca 420
ctaagtgatg cctatcgcta ttttgcatta gcacgtgaaa tgaaaggtaa tagttttaca 480
cctaaagaaa aagtttctaa tagtttttt cacactgtaa tgagaaatga tggattatct 540
ataatatctg ttatagtaaa tgtttgctac gatttctctt tgaacaattt gtcaatatcg 600
ccttacatat gtggaggagc aggggtagat gctatagaat tcttcgatgt attacacatt 660
aagtttgcat atcaaagcaa gctaggtatt gcttattctc taccatctaa cattagtctc 720
tttgctagtt tatattacca taaagtaatg ggcaatcaat ttaaaaattt aaatgtccaa 780
gatgttgctg aacttgcaag tatacctaaa attacatccg cagttgctac acttaatatt 840
ggttattttg gaggtgaaat tggtgcaaga ttgacatttt aa                    882
```

<210> 44
<211> 293
<212> PRT
<213> Ehrlichia canis

<400> 44

```
Met Asn Asn Lys Leu Lys Phe Thr Ile Ile Asn Thr Val Leu Val Cys
  1               5                  10                  15

Leu Leu Ser Leu Pro Asn Ile Ser Ser Ser Lys Ala Ile Asn Asn Asn
             20                  25                  30

Ala Lys Lys Tyr Tyr Gly Leu Tyr Ile Ser Gly Gln Tyr Lys Pro Ser
         35                  40                  45

Val Ser Val Phe Ser Asn Phe Ser Val Lys Glu Thr Asn Val Ile Thr
     50                  55                  60

Lys Asn Leu Ile Ala Leu Lys Lys Asp Val Asp Ser Ile Glu Thr Lys
 65                  70                  75                  80

Thr Asp Ala Ser Val Gly Ile Ser Asn Pro Ser Asn Phe Thr Ile Pro
                 85                  90                  95

Tyr Thr Ala Val Phe Gln Asp Asn Ser Val Asn Phe Asn Gly Thr Ile
            100                 105                 110

Gly Tyr Thr Phe Ala Glu Gly Thr Arg Val Glu Ile Glu Gly Ser Tyr
        115                 120                 125

Glu Glu Phe Asp Val Lys Asn Pro Gly Gly Tyr Thr Leu Ser Asp Ala
    130                 135                 140

Tyr Arg Tyr Phe Ala Leu Ala Arg Glu Met Lys Gly Asn Ser Phe Thr
145                 150                 155                 160

Pro Lys Glu Lys Val Ser Asn Ser Phe Phe His Thr Val Met Arg Asn
                165                 170                 175

Asp Gly Leu Ser Ile Ile Ser Val Ile Val Asn Val Cys Tyr Asp Phe
            180                 185                 190

Ser Leu Asn Asn Leu Ser Ile Ser Pro Tyr Ile Cys Gly Gly Ala Gly
        195                 200                 205

Val Asp Ala Ile Glu Phe Phe Asp Val Leu His Ile Lys Phe Ala Tyr
    210                 215                 220

Gln Ser Lys Leu Gly Ile Ala Tyr Ser Leu Pro Ser Asn Ile Ser Leu
225                 230                 235                 240

Phe Ala Ser Leu Tyr Tyr His Lys Val Met Gly Asn Gln Phe Lys Asn
                245                 250                 255
```

Leu Asn Val Gln Asp Val Ala Glu Leu Ala Ser Ile Pro Lys Ile Thr
260 265 270

Ser Ala Val Ala Thr Leu Asn Ile Gly Tyr Phe Gly Gly Glu Ile Gly
275 280 285

Ala Arg Leu Thr Phe
290

<210> 45
<211> 900
<212> DNA
<213> Ehrlichia canis

<400> 45
atgaatagca agagtaagtt ctttacaata tgtacatcgt taatatgctt attatcatca 60
cctaacacat ctctctcaaa cttcataggc aatagtacaa aacattctgg attatatgtt 120
agcggacatt ataagcccag cgtttccatt tttagcaaat tttcagtaaa agaaacaaat 180
acacatacag tacagttagt agctcttaaa aaagatgtta attctatttc tatgaacatc 240
agtaatggtg ctacaggcat tagcaaagca acaaatttta atcttcctta tgttgcagaa 300
tttcaagaca atgccttcaa cttcagtgga gctattggtt attcactttt tgaacaacta 360
aacattgaag ttgaaggttc ttatgaagaa ttcgatgcca aaaatcctgg tggttatatt 420
ttaaatgatg cattccgcta ttttgcattg gcacgtgaaa tgggacaaga aaaaaatgat 480
aataagcatc ttagtcctaa ggaggagcat gatataagta aaacatatta cacagtcatg 540
agaaataatg ggttatctat attatctatt atgataaatg gctgctataa tctacctctc 600
aatgatttat caatatcacc ttatttttgt acaggaatag gtgtagatgc tatagaattt 660
tttgatgcac tgcatcttaa acttgctttg caaagtaaaa taggagctac ttaccaatta 720
tcagacaaca ttagtttatt tacaaatgga tattaccatc aagtaatagg tgatcaattt 780
aaaaacttaa aagtccaata tataggtgaa cttaaagaga acccgaaaat tacatctgca 840
gttgctactc tcaatgttgg atactttgga ggtgaaattg gagtaagact cacactttaa 900

<210> 46
<211> 299
<212> PRT
<213> Ehrlichia canis

<400> 46
Met Asn Ser Lys Ser Lys Phe Phe Thr Ile Cys Thr Ser Leu Ile Cys
1 5 10 15

Leu Leu Ser Ser Pro Asn Thr Ser Leu Ser Asn Phe Ile Gly Asn Ser
20 25 30

Thr Lys His Ser Gly Leu Tyr Val Ser Gly His Tyr Lys Pro Ser Val
35 40 45

Ser Ile Phe Ser Lys Phe Ser Val Lys Glu Thr Asn Thr His Thr Val
50 55 60

Gln Leu Val Ala Leu Lys Lys Asp Val Asn Ser Ile Ser Met Asn Ile
65 70 75 80

```
Ser Asn Gly Ala Thr Gly Ile Ser Lys Ala Thr Asn Phe Asn Leu Pro
                 85                  90                  95

Tyr Val Ala Glu Phe Gln Asp Asn Ala Phe Asn Phe Ser Gly Ala Ile
            100                 105                 110

Gly Tyr Ser Leu Phe Glu Gln Leu Asn Ile Glu Val Glu Gly Ser Tyr
        115                 120                 125

Glu Glu Phe Asp Ala Lys Asn Pro Gly Gly Tyr Ile Leu Asn Asp Ala
    130                 135                 140

Phe Arg Tyr Phe Ala Leu Ala Arg Glu Met Gly Gln Glu Lys Asn Asp
145                 150                 155                 160

Asn Lys His Leu Ser Pro Lys Glu Glu His Asp Ile Ser Lys Thr Tyr
                165                 170                 175

Tyr Thr Val Met Arg Asn Asn Gly Leu Ser Ile Leu Ser Ile Met Ile
            180                 185                 190

Asn Gly Cys Tyr Asn Leu Pro Leu Asn Asp Leu Ser Ile Ser Pro Tyr
        195                 200                 205

Phe Cys Thr Gly Ile Gly Val Asp Ala Ile Glu Phe Phe Asp Ala Leu
    210                 215                 220

His Leu Lys Leu Ala Leu Gln Ser Lys Ile Gly Ala Thr Tyr Gln Leu
225                 230                 235                 240

Ser Asp Asn Ile Ser Leu Phe Thr Asn Gly Tyr Tyr His Gln Val Ile
                245                 250                 255

Gly Asp Gln Phe Lys Asn Leu Lys Val Gln Tyr Ile Gly Glu Leu Lys
            260                 265                 270

Glu Asn Pro Lys Ile Thr Ser Ala Val Ala Thr Leu Asn Val Gly Tyr
        275                 280                 285

Phe Gly Gly Glu Ile Gly Val Arg Leu Thr Leu
    290                 295
```

<210> 47
<211> 843
<212> DNA
<213> Ehrlichia canis

<400> 47
atgaattata agaaaattct agtaagaagc gcgttaatct cattaatgtc aatcttacca 60
tatcagtctt ttgcagatcc tgtaggttca agaactaatg ataacaaaga aggcttctac 120
attagtgcaa agtacaatcc aagtatatca cactttagaa aattctctgc tgaagaaact 180
cctattaatg gaacaaattc tctcactaaa aaagttttcg gactaaagaa agatggtgat 240
ataacaaaaa aagacgattt tacaagagta gctccaggca ttgattttca aaataactta 300

atatcaggat tttcaggaag tattggttac tctatggacg gaccaagaat agaacttgaa 360
gctgcatatc aacaatttaa tccaaaaaac accgataaca atgatactga taatggtgaa 420
tactataaac attttgcatt atctcgtaaa gatgcaatgg aagatcagca atatgtagta 480
cttaaaaatg acggcataac ttttatgtca ttgatggtta atacttgcta tgacattaca 540
gctgaaggag tatctttcgt accatatgca tgtgcaggta taggagcaga tcttatcact 600
atttttaaag acctcaatct aaaatttgct taccaaggaa aaataggtat tagttaccct 660
atcacaccag aagtctctgc atttattggt ggatactacc atggcgttat tggtaataaa 720
tttgagaaga tacctgtaat aactcctgta gtattaaatg atgctcctca aaccacatct 780
gcttcagtaa ctcttgacgt tggatacttt ggcggagaaa ttggaatgag gttcaccttc 840
taa 843

<210> 48
<211> 280
<212> PRT
<213> Ehrlichia canis

<400> 48
Met Asn Tyr Lys Lys Ile Leu Val Arg Ser Ala Leu Ile Ser Leu Met
1 5 10 15

Ser Ile Leu Pro Tyr Gln Ser Phe Ala Asp Pro Val Gly Ser Arg Thr
20 25 30

Asn Asp Asn Lys Glu Gly Phe Tyr Ile Ser Ala Lys Tyr Asn Pro Ser
35 40 45

Ile Ser His Phe Arg Lys Phe Ser Ala Glu Glu Thr Pro Ile Asn Gly
50 55 60

Thr Asn Ser Leu Thr Lys Lys Val Phe Gly Leu Lys Lys Asp Gly Asp
65 70 75 80

Ile Thr Lys Lys Asp Asp Phe Thr Arg Val Ala Pro Gly Ile Asp Phe
85 90 95

Gln Asn Asn Leu Ile Ser Gly Phe Ser Gly Ser Ile Gly Tyr Ser Met
100 105 110

Asp Gly Pro Arg Ile Glu Leu Glu Ala Ala Tyr Gln Gln Phe Asn Pro
115 120 125

Lys Asn Thr Asp Asn Asn Asp Thr Asp Asn Gly Glu Tyr Tyr Lys His
130 135 140

Phe Ala Leu Ser Arg Lys Asp Ala Met Glu Asp Gln Gln Tyr Val Val
145 150 155 160

Leu Lys Asn Asp Gly Ile Thr Phe Met Ser Leu Met Val Asn Thr Cys
165 170 175

Tyr Asp Ile Thr Ala Glu Gly Val Ser Phe Val Pro Tyr Ala Cys Ala
180 185 190

Gly Ile Gly Ala Asp Leu Ile Thr Ile Phe Lys Asp Leu Asn Leu Lys
195 200 205

Phe Ala Tyr Gln Gly Lys Ile Gly Ile Ser Tyr Pro Ile Thr Pro Glu
210 215 220

Val Ser Ala Phe Ile Gly Gly Tyr Tyr His Gly Val Ile Gly Asn Lys
225 230 235 240

Phe Glu Lys Ile Pro Val Ile Thr Pro Val Val Leu Asn Asp Ala Pro
245 250 255

Gln Thr Thr Ser Ala Ser Val Thr Leu Asp Val Gly Tyr Phe Gly Gly
260 265 270

Glu Ile Gly Met Arg Phe Thr Phe
275 280

<210> 49
<211> 903
<212> DNA
<213> Ehrlichia chaffeensis

<400> 49
atgaagaaga aaaatcaatt tatcacaata agtacaatat tagtatgttt attgtcatta 60
tctaatgcat cactttcaaa cactacaaat agcagcacta aaaaacagtt tgggttatat 120
gttagtggac aatacaagcc tagtgtttct atttttagca atttctcagt aaaggaaact 180
aattttccta caaagtatct agcagctctt aaaaaagaca ttaattctgt cgaatttgac 240
gatagtgtta ctgctggcat tagttaccca cttaatttca gtactcctta tatagctgta 300
tttcaagata atatttctaa ttttaatggc gctattgggt acacttttgt tgaaggccca 360
agaattgaaa tagaaggttc ttatgaagaa ttcgatgtca aagacctgga agatatacag 420
aaatacaaga tgcataccgt tgactttgct ttagcacgtg atatagactc tattcctact 480
agcccaaaaa atagaacttc acatgatggc aacagttcat ataaggtata ccacactgta 540
atgaaaaatg aaggactatc tataatatcc attatggtca atggctgcta tgatttttct 600
tcagataatt tatcaatatt accttatgta tgtggtggta taggtgtaaa tgctatagag 660
tttttcgatg cattacatgt taaattcgcg tgtcagggta aattaggtat tacttatcca 720
ttatcttcca acgttagttt atttgctggt ggatattatc accaagtaat gggcaaccaa 780
tttaaaaatc taaatgttca acatgtagct gaacttaatg acgcacccaa agttacatct 840
gcagtagcta cacttgacat tgggtatttt ggtggtgaaa ttggagcaag gcttatattt 900
taa 903

<210> 50
<211> 300
<212> PRT
<213> Ehrlichia chaffeensis

<400> 50
Met Lys Lys Lys Asn Gln Phe Ile Thr Ile Ser Thr Ile Leu Val Cys
1 5 10 15

Leu Leu Ser Leu Ser Asn Ala Ser Leu Ser Asn Thr Thr Asn Ser Ser
20 25 30

```
Thr Lys Lys Gln Phe Gly Leu Tyr Val Ser Gly Gln Tyr Lys Pro Ser
          35                  40                  45

Val Ser Ile Phe Ser Asn Phe Ser Val Lys Glu Thr Asn Phe Pro Thr
      50                  55                  60

Lys Tyr Leu Ala Ala Leu Lys Lys Asp Ile Asn Ser Val Glu Phe Asp
 65                  70                  75                  80

Asp Ser Val Thr Ala Gly Ile Ser Tyr Pro Leu Asn Phe Ser Thr Pro
                 85                  90                  95

Tyr Ile Ala Val Phe Gln Asp Asn Ile Ser Asn Phe Asn Gly Ala Ile
            100                 105                 110

Gly Tyr Thr Phe Val Glu Gly Pro Arg Ile Glu Ile Glu Gly Ser Tyr
        115                 120                 125

Glu Glu Phe Asp Val Lys Asp Leu Glu Asp Ile Gln Lys Tyr Lys Met
    130                 135                 140

His Thr Val Asp Phe Ala Leu Ala Arg Asp Ile Asp Ser Ile Pro Thr
145                 150                 155                 160

Ser Pro Lys Asn Arg Thr Ser His Asp Gly Asn Ser Ser Tyr Lys Val
                165                 170                 175

Tyr His Thr Val Met Lys Asn Glu Gly Leu Ser Ile Ile Ser Ile Met
            180                 185                 190

Val Asn Gly Cys Tyr Asp Phe Ser Ser Asp Asn Leu Ser Ile Leu Pro
        195                 200                 205

Tyr Val Cys Gly Gly Ile Gly Val Asn Ala Ile Glu Phe Phe Asp Ala
    210                 215                 220

Leu His Val Lys Phe Ala Cys Gln Gly Lys Leu Gly Ile Thr Tyr Pro
225                 230                 235                 240

Leu Ser Ser Asn Val Ser Leu Phe Ala Gly Gly Tyr Tyr His Gln Val
                245                 250                 255

Met Gly Asn Gln Phe Lys Asn Leu Asn Val Gln His Val Ala Glu Leu
            260                 265                 270

Asn Asp Ala Pro Lys Val Thr Ser Ala Val Ala Thr Leu Asp Ile Gly
        275                 280                 285

Tyr Phe Gly Gly Glu Ile Gly Ala Arg Leu Ile Phe
    290                 295                 300
```

<210> 51
<211> 897
<212> DNA
<213> Ehrlichia chaffeensis

<400> 51
atgaatcaca aaagtatgct ctttacaata ggtacagctt tgatatcctt attgtcatta 60
cctaatgtat cattctcagg aatcataaat aacaatgcta acaatttagg tatatacatt 120
agtgggcaat ataaacccag tgtttctgtt tttagcaatt tctcagtaaa agaaactaac 180
ttcactacac aacagttagt agcacttaaa aaagatattg attctgttga cattagtacc 240
aatgctgata gcggtattaa taatccgcag aatttcacta tcccttatat accaaaattt 300
caagacaatg ctgctagttt tagtggagca cttggattct tctacgctag aggtttaaga 360
cttgaaatgg aaggttccta tgaagaattt gatgttaaaa accctggagg atatacaaaa 420
gtaaaagatg catatcgtta ctttgccctg gcacgtgaga tgcaatctgg tcaaacttgc 480
cctaaacaca aagaaacatc aggtattcaa cctcacggta tttatcacac tgttatgagg 540
aatgatgggg tatctatttc atctgtcata atcaatggtt gttataactt tactttaagt 600
aatctaccaa tatcacctta catgtgtgta ggtatgggaa tagatgctat acaatttttt 660
gattcactac atattaagtt tgcacatcaa agtaagttag gtattactta cccactatct 720
tcaaatgttc atttatttgc tgatagctat tatcataaag taataggtaa taaatttaaa 780
aatctaaggg ttcaacacgt ttatgaatta caacaggtac ctaaagttac atctgctgtt 840
gctacacttg atattgggta ttttggtggt gaagttggag taaggtttat actttaa 897

<210> 52
<211> 298
<212> PRT
<213> Ehrlichia chaffeensis

<400> 52
Met Asn His Lys Ser Met Leu Phe Thr Ile Gly Thr Ala Leu Ile Ser
1 5 10 15

Leu Leu Ser Leu Pro Asn Val Ser Phe Ser Gly Ile Ile Asn Asn Asn
20 25 30

Ala Asn Asn Leu Gly Ile Tyr Ile Ser Gly Gln Tyr Lys Pro Ser Val
35 40 45

Ser Val Phe Ser Asn Phe Ser Val Lys Glu Thr Asn Phe Thr Thr Gln
50 55 60

Gln Leu Val Ala Leu Lys Lys Asp Ile Asp Ser Val Asp Ile Ser Thr
65 70 75 80

Asn Ala Asp Ser Gly Ile Asn Asn Pro Gln Asn Phe Thr Ile Pro Tyr
85 90 95

Ile Pro Lys Phe Gln Asp Asn Ala Ala Ser Phe Ser Gly Ala Leu Gly
100 105 110

Phe Phe Tyr Ala Arg Gly Leu Arg Leu Glu Met Glu Gly Ser Tyr Glu
115 120 125

```
Glu Phe Asp Val Lys Asn Pro Gly Gly Tyr Thr Lys Val Lys Asp Ala
    130                 135                 140

Tyr Arg Tyr Phe Ala Leu Ala Arg Glu Met Gln Ser Gly Gln Thr Cys
145                 150                 155                 160

Pro Lys His Lys Glu Thr Ser Gly Ile Gln Pro His Gly Ile Tyr His
                165                 170                 175

Thr Val Met Arg Asn Asp Gly Val Ser Ile Ser Ser Val Ile Ile Asn
            180                 185                 190

Gly Cys Tyr Asn Phe Thr Leu Ser Asn Leu Pro Ile Ser Pro Tyr Met
        195                 200                 205

Cys Val Gly Met Gly Ile Asp Ala Ile Gln Phe Phe Asp Ser Leu His
    210                 215                 220

Ile Lys Phe Ala His Gln Ser Lys Leu Gly Ile Thr Tyr Pro Leu Ser
225                 230                 235                 240

Ser Asn Val His Leu Phe Ala Asp Ser Tyr Tyr His Lys Val Ile Gly
                245                 250                 255

Asn Lys Phe Lys Asn Leu Arg Val Gln His Val Tyr Glu Leu Gln Gln
            260                 265                 270

Val Pro Lys Val Thr Ser Ala Val Ala Thr Leu Asp Ile Gly Tyr Phe
        275                 280                 285

Gly Gly Glu Val Gly Val Arg Phe Ile Leu
    290                 295
```

<210> 53
<211> 882
<212> DNA
<213> Ehrlichia canis

<400> 53
atggcaaatt ttatgtacaa aaaatacaaa ctaatgacag caggtgtagt attatttcac 60
atgttatttc tacctcatgt ttctttcgca aaaaatacaa acagcaataa acttggatta 120
tacatcagtg gacagtataa ccctagtgtt tctgttttta gcaatttttc agcaaaagaa 180
accaatgttc atacagtaca actcatggcg cttaaaaaag acattgattc tattgaagtt 240
gatactggaa atagcgcagg tattagcaaa ccacaaaatt tcacagttct ttatactcca 300
aaatttcaag ataatgttgc tggtcttagc ggtgcacttg gattctttta ttctaaagga 360
ttaaggattg aaatggggtt ttcttatgaa aaatttgatg ctaaagacct tggtgagtac 420
accaaaataa aagatgctta tagatatttt gctctagtac gtgaaatgca tgttagtctc 480
atttatccaa aagataataa cacaggaaca cattatactg ttatgagaaa tgatggtata 540
tctatttctt ctgctacagt aaatggctgc tatgattctt ttttccagtt tatctttgtc 600
acctatatgt gtataggcat cggtatagat gctatagaat ttcttaatgc atacatatta 660
agtttgcttg ccaaggtagt taaggtgtta acttattctg tatctcccaa tgttaattta 720
tttgcagatg gatattatca taaagtgatg ggcaataaat ttaaaaattt acctgttcaa 780
tacgttaata ctttagaaga gtatccaaga gttacatctg caattgctac acttgatatt 840

ggctacctcg gtggtgaaat tggcataaga tttatatttt aa 882

<210> 54
<211> 293
<212> PRT
<213> Ehrlichia canis

<400> 54

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Met Ala Asn Phe Met Tyr Lys Lys Tyr Lys Leu Met Thr Ala Gly Val
  1               5                  10                  15

Val Leu Phe His Met Leu Phe Leu Pro His Val Ser Phe Ala Lys Asn
             20                  25                  30

Thr Asn Ser Asn Lys Leu Gly Leu Tyr Ile Ser Gly Gln Tyr Asn Pro
         35                  40                  45

Ser Val Ser Val Phe Ser Asn Phe Ser Ala Lys Glu Thr Asn Val His
     50                  55                  60

Thr Val Gln Leu Met Ala Leu Lys Lys Asp Ile Asp Ser Ile Glu Val
 65                  70                  75                  80

Asp Thr Gly Asn Ser Ala Gly Ile Ser Lys Pro Gln Asn Phe Thr Val
                 85                  90                  95

Leu Tyr Thr Pro Lys Phe Gln Asp Asn Val Ala Gly Leu Ser Gly Ala
            100                 105                 110

Leu Gly Phe Phe Tyr Ser Lys Gly Leu Arg Ile Glu Met Gly Phe Ser
        115                 120                 125

Tyr Glu Lys Phe Asp Ala Lys Asp Leu Gly Glu Tyr Thr Lys Ile Lys
    130                 135                 140

Asp Ala Tyr Arg Tyr Phe Ala Leu Val Arg Glu Met His Val Ser Leu
145                 150                 155                 160

Ile Tyr Pro Lys Asp Asn Asn Thr Gly Thr His Tyr Thr Val Met Arg
                165                 170                 175

Asn Asp Gly Ile Ser Ile Ser Ser Ala Thr Val Asn Gly Cys Tyr Asp
            180                 185                 190

Ser Phe Phe Gln Phe Ile Phe Val Thr Tyr Met Cys Ile Gly Ile Gly
        195                 200                 205

Ile Asp Ala Ile Glu Phe Leu Asn Ala Tyr Ile Leu Ser Leu Leu Ala
    210                 215                 220

Lys Val Val Lys Val Leu Thr Tyr Ser Val Ser Pro Asn Val Asn Leu
225                 230                 235                 240
```

Phe Ala Asp Gly Tyr Tyr His Lys Val Met Gly Asn Lys Phe Lys Asn
245 250 255

Leu Pro Val Gln Tyr Val Asn Thr Leu Glu Glu Tyr Pro Arg Val Thr
260 265 270

Ser Ala Ile Ala Thr Leu Asp Ile Gly Tyr Leu Gly Gly Glu Ile Gly
275 280 285

Ile Arg Phe Ile Phe
290

<210> 55
<211> 891
<212> DNA
<213> Ehrlichia canis

<400> 55
atgggaaatt ctatgaataa taaaagtcaa ttcttaataa gatttatatt tttaacatgc 60
atgctgtcat tacctaatat atctctttca aaagtaaata acgaaaaaca ttctggtttg 120
tatattagcg ggcaatacaa acccagtgtt tctgttttca gtaatttttc agttaaagaa 180
accaactttc atacaaaaca tctcatagct cttaaacaag atgttgattc tgttgaaatt 240
gatactggta gtaatacagc aggtattagt aacccatcta actttacaat cccttatact 300
gcagaatttc aagacaacca tactaactgc aatggctcta ttggttatgc ttttgctgaa 360
ggtccaagaa ttgaaataga attatcatat gaaaaatttg atgttaaaaa tcccacaggg 420
tatactacag taaaagatgc ttatagatac tttgctttag cacgtgaaat aaatatttct 480
ctattccaac caaaacaaaa agaaggtagt ggaatttacc atgtcgtaat gaaaaacgat 540
gggttatcta tcttatccaa tatagttaat atttgctacg atttttcttt aaataattta 600
cctatatcac cttatttatg cggaggaatg ggtataaatg ccatagaatt ctttgacgct 660
ttacatgtga aatttgctta tcaaagcaag gcaggaatta gttatcaact attacgtaaa 720
atcaacttat ttattgatgt atattactac gaagtaataa gtaataaatt taaaaacctg 780
aaagtccaac atgtacatga acttaaagat aatccaaaag tcacatctgc agttgctaca 840
cttgatatag catattttgg tagtgaagct ggcataagaa ttatatttta a 891

<210> 56
<211> 296
<212> PRT
<213> Ehrlichia canis

<400> 56
Met Gly Asn Ser Met Asn Asn Lys Ser Gln Phe Leu Ile Arg Phe Ile
1 5 10 15

Phe Leu Thr Cys Met Leu Ser Leu Pro Asn Ile Ser Leu Ser Lys Val
20 25 30

Asn Asn Glu Lys His Ser Gly Leu Tyr Ile Ser Gly Gln Tyr Lys Pro
35 40 45

Ser Val Ser Val Phe Ser Asn Phe Ser Val Lys Glu Thr Asn Phe His
50 55 60

```
Thr Lys His Leu Ile Ala Leu Lys Gln Asp Val Asp Ser Val Glu Ile
 65                  70                  75                  80

Asp Thr Gly Ser Asn Thr Ala Gly Ile Ser Asn Pro Ser Asn Phe Thr
                 85                  90                  95

Ile Pro Tyr Thr Ala Glu Phe Gln Asp Asn His Thr Asn Cys Asn Gly
            100                 105                 110

Ser Ile Gly Tyr Ala Phe Ala Glu Gly Pro Arg Ile Glu Ile Glu Leu
        115                 120                 125

Ser Tyr Glu Lys Phe Asp Val Lys Asn Pro Thr Gly Tyr Thr Thr Val
    130                 135                 140

Lys Asp Ala Tyr Arg Tyr Phe Ala Leu Ala Arg Glu Ile Asn Ile Ser
145                 150                 155                 160

Leu Phe Gln Pro Lys Gln Lys Glu Gly Ser Gly Ile Tyr His Val Val
                165                 170                 175

Met Lys Asn Asp Gly Leu Ser Ile Leu Ser Asn Ile Val Asn Ile Cys
            180                 185                 190

Tyr Asp Phe Ser Leu Asn Asn Leu Pro Ile Ser Pro Tyr Leu Cys Gly
        195                 200                 205

Gly Met Gly Ile Asn Ala Ile Glu Phe Phe Asp Ala Leu His Val Lys
    210                 215                 220

Phe Ala Tyr Gln Ser Lys Ala Gly Ile Ser Tyr Gln Leu Leu Arg Lys
225                 230                 235                 240

Ile Asn Leu Phe Ile Asp Val Tyr Tyr Tyr Glu Val Ile Ser Asn Lys
                245                 250                 255

Phe Lys Asn Leu Lys Val Gln His Val His Glu Leu Lys Asp Asn Pro
            260                 265                 270

Lys Val Thr Ser Ala Val Ala Thr Leu Asp Ile Ala Tyr Phe Gly Ser
        275                 280                 285

Glu Ala Gly Ile Arg Ile Ile Phe
    290                 295
```

<210> 57
<211> 846
<212> DNA
<213> Ehrlichia canis

<400> 57
atgaataata aaagaaattt ttttttaata ggtatgtctc tattgataaa tctactattg 60
ccaattgatg cctcttctat ggaagtacat aattatacac attttacacc taggctgtat 120

attagtgggc aatacaggcc aggagtttcc cactttagca aattttcagt caaagaaaca 180
cattgtaata ctgtgcaatt agttgggcta acaaaagata taaaagtaac taataacagt 240
agtatcaaca caaatactag ttttaacttt ccttatgttg cagaatttca agataacgca 300
atgagcttta gtggagcaat aggatgcttt tattcagaac acttcagaat tgaagtagaa 360
gcttcttatg aagaatttga cgttaaaaat cctgaaggat ctactacaga ctcctataga 420
tatttcgcgt tagcacgtgg catggatggt aataatattc ctacaagtca aaaatttact 480
gtaatgagaa acgacgggtt attaatctca tctgttatga taaatggctg ttacaatgtc 540
atactaaatg atatacaagc agaaccttac atatgtgcag gactaggagg agattttata 600
gaattcttca atggctttca tgttaagcta gcttatcaag gtaaagtagg cattagttat 660
caaatattcc ctgaagtaag attatttatt gatggatact accataaagt aaaaggcaac 720
aagtttaaaa atttacacgt tcaacatgta ggtgcacttg cagcactccc taaagttaca 780
tctgcagttg caacacttaa tattggatac tttggttgtg aagctggagt aagattcata 840
ttttaa 846

<210> 58
<211> 281
<212> PRT
<213> Ehrlichia canis

<400> 58
Met Asn Asn Lys Arg Asn Phe Phe Leu Ile Gly Met Ser Leu Leu Ile
1 5 10 15

Asn Leu Leu Leu Pro Ile Asp Ala Ser Ser Met Glu Val His Asn Tyr
20 25 30

Thr His Phe Thr Pro Arg Leu Tyr Ile Ser Gly Gln Tyr Arg Pro Gly
35 40 45

Val Ser His Phe Ser Lys Phe Ser Val Lys Glu Thr His Cys Asn Thr
50 55 60

Val Gln Leu Val Gly Leu Thr Lys Asp Ile Lys Val Thr Asn Asn Ser
65 70 75 80

Ser Ile Asn Thr Asn Thr Ser Phe Asn Phe Pro Tyr Val Ala Glu Phe
85 90 95

Gln Asp Asn Ala Met Ser Phe Ser Gly Ala Ile Gly Cys Phe Tyr Ser
100 105 110

Glu His Phe Arg Ile Glu Val Glu Ala Ser Tyr Glu Glu Phe Asp Val
115 120 125

Lys Asn Pro Glu Gly Ser Thr Thr Asp Ser Tyr Arg Tyr Phe Ala Leu
130 135 140

Ala Arg Gly Met Asp Gly Asn Asn Ile Pro Thr Ser Gln Lys Phe Thr
145 150 155 160

Val Met Arg Asn Asp Gly Leu Leu Ile Ser Ser Val Met Ile Asn Gly
165 170 175

```
Cys Tyr Asn Val Ile Leu Asn Asp Ile Gln Ala Glu Pro Tyr Ile Cys
            180                 185                 190

Ala Gly Leu Gly Gly Asp Phe Ile Glu Phe Phe Asn Gly Phe His Val
        195                 200                 205

Lys Leu Ala Tyr Gln Gly Lys Val Gly Ile Ser Tyr Gln Ile Phe Pro
    210                 215                 220

Glu Val Arg Leu Phe Ile Asp Gly Tyr Tyr His Lys Val Lys Gly Asn
225                 230                 235                 240

Lys Phe Lys Asn Leu His Val Gln His Val Gly Ala Leu Ala Ala Leu
                245                 250                 255

Pro Lys Val Thr Ser Ala Val Ala Thr Leu Asn Ile Gly Tyr Phe Gly
            260                 265                 270

Cys Glu Ala Gly Val Arg Phe Ile Phe
        275                 280
```

<210> 59
<211> 840
<212> DNA
<213> Ehrlichia canis

<400> 59
atgaacaaaa agaaaattat tacagtagga acaacattag cttatttatt attatcacct 60
aacatatctt tttcagaagt aatcaacaat gatactgata aatattctag actatatata 120
agtggtcaat ataaaccagg attttcttat tttaataagt tctcagttag agaaactgat 180
catttcacta aagcattaat aggattaaga catgacgcaa tatctactaa aaatttaaca 240
actaatacag atttcaatac tctttataaa gtaacatttc aaaacaacat cattagcttt 300
agcggtgcta ttggttattc tgatagcaca ggtgtaaggt ttgagctaga aggctcttat 360
gaagagttcg atgttacaga ccctggagat tgtataataa aagatactta caggtacttt 420
gcattagcta gaaaaacaag tggtaatcat cccaacgata atggggaata tactgtcatg 480
agaaatgatg gagtatccat tacctccgtt atattcaatg gttgttatga tctctcttta 540
aaagagctag aaatatcacc atatgtttgc attggtatcg gaggagactt tatagaattt 600
tttgatgctt tacacattaa attagcatat caaggtaaac taggtattag ctattctttt 660
tccactagaa caaatttatt tatcgattgt tattaccata gagttatagg taatcaattt 720
aataatttaa atgttcaaca tgtagttgag cttacagaag cacctaaagc tacatctgca 780
attgctacac ttaatgttag ttacttcggt ggagaagttg gaattagact tatgttttaa 840

<210> 60
<211> 279
<212> PRT
<213> Ehrlichia canis

<400> 60
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Met Asn Lys Lys Lys Ile Ile Thr Val Gly Thr Thr Leu Ala Tyr Leu
  1               5                  10                  15
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Leu Leu Ser Pro Asn Ile Ser Phe Ser Glu Val Ile Asn Asn Asp Thr
            20                  25                  30

Asp Lys Tyr Ser Arg Leu Tyr Ile Ser Gly Gln Tyr Lys Pro Gly Phe
        35                  40                  45

Ser Tyr Phe Asn Lys Phe Ser Val Arg Glu Thr Asp His Phe Thr Lys
    50                  55                  60

Ala Leu Ile Gly Leu Arg His Asp Ala Ile Ser Thr Lys Asn Leu Thr
65                  70                  75                  80

Thr Asn Thr Asp Phe Asn Thr Leu Tyr Lys Val Thr Phe Gln Asn Asn
                85                  90                  95

Ile Ile Ser Phe Ser Gly Ala Ile Gly Tyr Ser Asp Ser Thr Gly Val
            100                 105                 110

Arg Phe Glu Leu Glu Gly Ser Tyr Glu Glu Phe Asp Val Thr Asp Pro
        115                 120                 125

Gly Asp Cys Ile Ile Lys Asp Thr Tyr Arg Tyr Phe Ala Leu Ala Arg
    130                 135                 140

Lys Thr Ser Gly Asn His Pro Asn Asp Asn Gly Glu Tyr Thr Val Met
145                 150                 155                 160

Arg Asn Asp Gly Val Ser Ile Thr Ser Val Ile Phe Asn Gly Cys Tyr
                165                 170                 175

Asp Leu Ser Leu Lys Glu Leu Glu Ile Ser Pro Tyr Val Cys Ile Gly
            180                 185                 190

Ile Gly Gly Asp Phe Ile Glu Phe Phe Asp Ala Leu His Ile Lys Leu
        195                 200                 205

Ala Tyr Gln Gly Lys Leu Gly Ile Ser Tyr Ser Phe Ser Thr Arg Thr
    210                 215                 220

Asn Leu Phe Ile Asp Cys Tyr Tyr His Arg Val Ile Gly Asn Gln Phe
225                 230                 235                 240

Asn Asn Leu Asn Val Gln His Val Val Glu Leu Thr Glu Ala Pro Lys
                245                 250                 255

Ala Thr Ser Ala Ile Ala Thr Leu Asn Val Ser Tyr Phe Gly Gly Glu
            260                 265                 270

Val Gly Ile Arg Leu Met Phe
        275
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<210> 61
<211> 726
<212> DNA
<213> Ehrlichia canis

<400> 61
cccgtcgttt ctcattacag tgacttttca attaaagaaa cttatactaa cactgaggca 60
ttgtttgggc taaaacaaga tattagttct attttacgta ataaagagac cacacaatat 120
aataacaatt ttaacgttcc ctatactgca aaatttcaag acgactttgc gagtttcagc 180
atagctgttg gatatattgc taacaatggt ccaagaattg aaatagaagg atcttacgaa 240
gaatttgatg ttaaaaaccc aggaaattat acaacaatag atgctcatag gtacattgct 300
ttagctagag aaaaaacttc ttactatcta agttctccta aagaaaacaa atatgtaatt 360
ataaagaata acggcatatc tattgtatct attataatta atggttgtta tgatatttct 420
ttaaatgatt ctaaggtgtc accttacata tgcacagggt ttggtggaga ttttatagag 480
ttttttagtg ctatacgttt taagtttgct tatcaaggta aaataggtat cagttattca 540
ttatcttcta acataatttt atttactgat ggatattacc acaaggtaat aaattcccaa 600
tttaaaaatt taaatgttga acatgttgtt aatgagttaa ctacagatcc taaagtgact 660
tctgcaacag catttcttaa tattgagtat tttggtggtg aatttggatt aaaatttata 720
ttttaa 726

<210> 62
<211> 241
<212> PRT
<213> Ehrlichia canis

<400> 62
Pro Val Val Ser His Tyr Ser Asp Phe Ser Ile Lys Glu Thr Tyr Thr
1 5 10 15

Asn Thr Glu Ala Leu Phe Gly Leu Lys Gln Asp Ile Ser Ser Ile Leu
20 25 30

Arg Asn Lys Glu Thr Thr Gln Tyr Asn Asn Asn Phe Asn Val Pro Tyr
35 40 45

Thr Ala Lys Phe Gln Asp Asp Phe Ala Ser Phe Ser Ile Ala Val Gly
50 55 60

Tyr Ile Ala Asn Asn Gly Pro Arg Ile Glu Ile Glu Gly Ser Tyr Glu
65 70 75 80

Glu Phe Asp Val Lys Asn Pro Gly Asn Tyr Thr Thr Ile Asp Ala His
85 90 95

Arg Tyr Ile Ala Leu Ala Arg Glu Lys Thr Ser Tyr Tyr Leu Ser Ser
100 105 110

Pro Lys Glu Asn Lys Tyr Val Ile Ile Lys Asn Asn Gly Ile Ser Ile
115 120 125

Val Ser Ile Ile Ile Asn Gly Cys Tyr Asp Ile Ser Leu Asn Asp Ser
130 135 140

Lys Val Ser Pro Tyr Ile Cys Thr Gly Phe Gly Gly Asp Phe Ile Glu
145 150 155 160

Phe Phe Ser Ala Ile Arg Phe Lys Phe Ala Tyr Gln Gly Lys Ile Gly
165 170 175

Ile Ser Tyr Ser Leu Ser Ser Asn Ile Ile Leu Phe Thr Asp Gly Tyr
180 185 190

Tyr His Lys Val Ile Asn Ser Gln Phe Lys Asn Leu Asn Val Glu His
195 200 205

Val Val Asn Glu Leu Thr Thr Asp Pro Lys Val Thr Ser Ala Thr Ala
210 215 220

Phe Leu Asn Ile Glu Tyr Phe Gly Gly Glu Phe Gly Leu Lys Phe Ile
225 230 235 240

Phe

<210> 63
<211> 19
<212> PRT
<213> Ehrlichia chaffeensis

<400> 63
Asp Pro Ala Gly Ser Gly Ile Asn Gly Asn Phe Tyr Ile Ser Gly Lys
1 5 10 15

Tyr Met Pro

<210> 64
<211> 34
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<220>
<221> modified_base
<222> (17)
<223> a, c, g or t

<220>
<221> modified_base
<222> (26)
<223> a, c, g or t

<400> 64
cgggatccga attcggnath aayggnaayt tyta 34

<210> 65
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 65
agcggccgct taraayasra aycttsctcc 30

<210> 66
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 66
acctaacttt ccttggtaag 20

<210> 67
<211> 281
<212> PRT
<213> Ehrlichia chaffeensis

<400> 67
Met Asn Tyr Lys Lys Val Phe Ile Thr Ser Ala Leu Ile Ser Leu Ile
1 5 10 15

Ser Ser Leu Pro Gly Val Ser Phe Ser Asp Pro Ala Gly Ser Gly Ile
20 25 30

Asn Gly Asn Phe Tyr Ile Ser Gly Lys Tyr Met Pro Ser Ala Ser His
35 40 45

Phe Gly Val Phe Ser Ala Lys Glu Glu Arg Asn Thr Thr Val Gly Val
50 55 60

Phe Gly Leu Lys Gln Asn Trp Asp Gly Ser Ala Ile Ser Asn Ser Ser
65 70 75 80

Pro Asn Asp Val Phe Thr Val Ser Asn Tyr Ser Phe Lys Tyr Glu Asn
85 90 95

Asn Pro Phe Leu Gly Phe Ala Gly Ala Ile Gly Tyr Ser Met Asp Gly
100 105 110

Pro Arg Ile Glu Leu Glu Val Ser Tyr Glu Thr Phe Asp Val Lys Asn
115 120 125

Gln Gly Asn Asn Tyr Lys Asn Glu Ala His Arg Tyr Cys Ala Leu Ser
130 135 140

His Asn Ser Ala Ala Asp Met Ser Ser Ala Ser Asn Asn Phe Val Phe
145 150 155 160

Leu Lys Asn Glu Gly Leu Leu Asp Ile Ser Phe Met Leu Asn Ala Cys
165 170 175

Tyr Asp Val Val Gly Glu Gly Ile Pro Phe Ser Pro Tyr Ile Cys Ala
180 185 190

Gly Ile Gly Thr Asp Leu Val Ser Met Phe Glu Ala Thr Asn Pro Lys
195 200 205

Ile Ser Tyr Gln Gly Lys Leu Gly Leu Ser Tyr Ser Ile Ser Pro Glu
210 215 220

Ala Ser Val Phe Ile Gly Gly His Phe His Lys Val Leu Gly Asn Glu
225 230 235 240

Phe Arg Asp Ile Pro Thr Ile Ile Pro Thr Gly Ser Thr Leu Ala Gly
245 250 255

Lys Gly Asn Tyr Pro Ala Ile Val Ile Leu Asp Val Cys His Phe Gly
260 265 270

Ile Glu Leu Gly Gly Arg Phe Val Phe
275 280

<210> 68
<211> 756
<212> DNA
<213> Ehrlichia chaffeensis

<400> 68
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gtattctctg ctaaggaaga aagaaataca acagttggag tgtttggact gaagcaaaat 120
tgggacggaa gcgcaatatc caactcctcc ccaaacgatg tattcactgt ctcaaattat 180
tcatttaaat atgaaaacaa cccgttttta ggttttgcag gagctattgg ttactcaatg 240
gatggtccaa gaatagagct tgaagtatct tatgaaacat ttgatgtaaa aaatcaaggt 300
aacaattata agaatgaagc acatagatat tgtgctctat cccataactc agcagcagac 360
atgagtagtg caagtaataa ttttgtcttt ctaaaaaatg aaggattact tgacatatca 420
tttatgctga acgcatgcta tgacgtagta ggcgaaggca tacctttttc tccttatata 480
tgcgcaggta tcggtactga tttagtatcc atgtttgaag ctacaaatcc taaaatttct 540
taccaaggaa agttaggttt aagctactct ataagcccag aagcttctgt gtttattggt 600

gggcactttc ataaggtaat agggaacgaa tttagagata ttcctactat aatacctact 660
ggatcaacac ttgcaggaaa aggaaactac cctgcaatag taatactgga tgtatgccac 720
tttggaatag aacttggagg aaggtttgct ttctaa 756

<210> 69
<211> 283
<212> PRT
<213> Cowdria ruminantium

<400> 69

Met	Asn	Cys	Lys	Lys	Ile	Phe	Ile	Thr	Ser	Thr	Leu	Ile	Ser	Leu	Val
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Ser	Phe	Leu	Pro	Gly	Val	Ser	Phe	Ser	Asp	Val	Ile	Gln	Glu	Glu	Asn
			20					25					30		
Asn	Pro	Val	Gly	Ser	Val	Tyr	Ile	Ser	Ala	Lys	Tyr	Met	Pro	Thr	Ala
		35					40					45			
Ser	His	Phe	Gly	Lys	Met	Ser	Ile	Lys	Glu	Asp	Ser	Arg	Asp	Thr	Lys
	50					55					60				
Ala	Val	Phe	Gly	Leu	Lys	Lys	Asp	Trp	Asp	Gly	Val	Lys	Thr	Pro	Ser
65					70					75					80
Gly	Asn	Thr	Asn	Ser	Ile	Phe	Thr	Glu	Lys	Asp	Tyr	Ser	Phe	Lys	Tyr
				85					90					95	
Glu	Asn	Asn	Pro	Phe	Leu	Gly	Phe	Ala	Gly	Ala	Val	Gly	Tyr	Ser	Met
			100					105					110		
Asn	Gly	Pro	Arg	Ile	Glu	Phe	Glu	Val	Ser	Tyr	Glu	Thr	Phe	Asp	Val
		115					120					125			
Arg	Asn	Pro	Gly	Gly	Asn	Tyr	Lys	Asn	Asp	Ala	His	Met	Tyr	Cys	Ala
	130					135					140				
Leu	Asp	Thr	Ala	Ser	Ser	Ser	Thr	Ala	Gly	Ala	Thr	Thr	Ser	Val	Met
145					150					155					160
Val	Lys	Asn	Glu	Asn	Leu	Thr	Asp	Ile	Ser	Leu	Met	Leu	Asn	Ala	Cys
				165					170					175	
Tyr	Asp	Ile	Met	Leu	Asp	Gly	Met	Pro	Val	Ser	Pro	Tyr	Val	Cys	Ala
			180					185					190		
Gly	Ile	Gly	Thr	Asp	Leu	Val	Ser	Val	Ile	Asn	Ala	Thr	Asn	Pro	Lys
		195					200					205			
Leu	Ser	Tyr	Gln	Gly	Lys	Leu	Gly	Ile	Ser	Tyr	Ser	Ile	Asn	Pro	Glu
	210					215					220				

```
Ala Ser Ile Phe Ile Gly Gly His Phe His Arg Val Ile Gly Asn Glu
225                 230                 235                 240

Phe Lys Asp Ile Ala Thr Ser Lys Val Phe Thr Ser Ser Gly Asn Ala
                245                 250                 255

Ser Ser Ala Val Ser Pro Gly Phe Ala Ser Ala Ile Leu Asp Val Cys
            260                 265                 270

His Phe Gly Ile Glu Ile Gly Arg Phe Val Phe
        275                 280
```